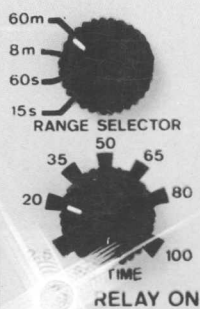


S-SYSTEM

ELECTRONIC CONTROL- AND MONITORING MODULES

electromatic
S - SYSTEM
SABC 207 220
SUPPLY 220 V AC
COMBI





This new S-system catalogue together with a new catalogue comprising the complimentary sensors replace our eight previous S-system catalogues. This innovation should facilitate your survey of our entire range of accessories and S-systems now covering more than sixty main functions.

From the introduction of the first S-systems in 1962 till now, the range of S-systems has been steadily extended, now including such complex functions as e.g. digital controllers for wind-driven generators, a combi-timer with four different functions and time ranges, and a $\cos \varphi$ relay for monitoring of electrical loads. At the same time the exsisting systems have continuously been further developed and improved.

The success of the S-systems is due to several reasons, i.e. the uniform modular plug-in design, the common technical specifications covering all S-systems, the easy installation, and the pro-user adjustment and operation.

With this catalogue we intend to enable you to solve most electronic control problems by looking in the index for the required function, selecting the right S-system(s) from the pages in question (each S-system being described in one page), and finally ordering by one of our many subsidiaries or qualified agents, who will offer you the required technical support.

ELECTROMATIC is situated in a modern manufacturing complex now covering 17,000 m² in Hadsten, Denmark.

We wish to welcome you among our ever increasing number of ELECTROMATIC customers.

ELECTROMATIC

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TIMING RELAYS

FUNCTION

TYPE No. SPDT DPDT

PAGE

DELAY ON OPERATE

Automatic start.	Knob-adjustable:	0.15 s – 600 s.	Repeatability: $\pm 1\%$	SA 105	SA 205	14
Automatic start.	Knob-adjustable:	0.15 s – 600 s.	Repeatability: $\pm 1\%$	SA 115	SA 215	15
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Start by pulse.	Knob-adjustable:	0.15 s – 600 s.	Repeatability: $\pm 1\%$	SA 185	SA 285	23
Start by pulse.	Knob-adjustable:	0.15 s – 180 h.	Repeatability: $\pm 0.1\%$	SA 195		25
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Automatic start.	Knob-adjustable:	0.15 s – 600 s.	Repeatability: $\pm 1\%$	SB 115	SB 215	33
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Automatic start.	Knob-adjustable:	0.15 s – 180 h.	Repeatability: $\pm 0.1\%$	SB 155	SB 255	40
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Automatic start.	Digital setting:	0.1 s – 99 h.	Repeatability: $\pm 0.005\%$	SB 159	SB 259	41
Automatic start.	External adjustment:	0.15 s – 180 h.	Repeatability: $\pm 0.1\%$	SB 140	SB 240	36
Automatic start.	External adjustment:	0.15 s – 180 h.	Repeatability: $\pm 0.1\%$	SB 150		39
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Start by pulse.	Knob-adjustable:	0.15 s – 600 s.	Repeatability: $\pm 1\%$	SB 185	SB 285	46
Start by pulse.	Knob-adjustable:	0.15 s – 180 h.	Repeatability: $\pm 0.1\%$	SB 165		43
Start by pulse.	Digital setting:	0.1 s – 99 h.	Repeatability: $\pm 0.005\%$	SB 169	SB 269	44
Start by pulse.	External adjustment:	0.15 s – 180 h.	Repeatability: $\pm 0.1\%$	SB 160		42

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After disconnection of contact.	Knob: 0.15 s – 180 h.	Repeatability: $\pm 0.1\%$		SB 165		43
After disconnection of contact.	Digitally: 0.1 s – 99 h.	Repeatability: $\pm 0.005\%$		SB 169	SB 269	44
After disconnection of contact.	Externally: 0.15 s – 180 h.	Repeatability: $\pm 0.1\%$		SB 160		42

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Start in OFF or ON position. Digital setting: 0.1 s – 99 h.	Repeatability: $\pm 0.005\%$	SC 149	SC 249	56
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SA 145	SA 245	17	Delay on operate.	Automatic start.	Knob-adjustable.	0.15 s–180 h
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SA 165		20	Delay on operate.	Automatic start.	Knob-adjustable.	0.15 s–180 h
SA 169	SA 269	21	Delay on operate.	Automatic start.	Digital setting.	0.1 s– 99 h
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SA 190		24	Delay on operate.	Start by pulse.	External adjustment.	0.15 s–180 h
SA 195		25	Delay on operate.	Start by pulse.	Knob adjustable.	0.15 s–180 h
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SB 169	SB 269	44	Interval timer/Delay on release.		Digital setting.	0.1 s– 99 h
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SC 140	SC 240	53	Recycler. ON time = OFF time: 0.15 s–180 h.		External adjustment.	
SC 141	SC 241	54	Recycler. ON time = OFF time: 0.15 s–180 h.		External adjustment.	
SC 145	SC 245	55	Recycler. ON time = OFF time: 0.15 s–180 h.		Knob-adjustable.	
SC 149	SC 249	56	Recycler. ON time = OFF time: 0.1 s– 99 h.		Digital setting.	
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SC 191	SC 291	63	Recycler. ON time: 0.5 s. External adjustment of OFF time: 0.8 s–180 h			
SC 195	SC 295	64	Recycler. ON time: 0.5 s. Knob-adjustable OFF time: 0.8 s–180 h.			
SC 199	SC 299	65	Recycler. ON time: 0.5 s. Digital adjustable OFF time: 1.0 s– 99 h.			
SD 110	SD 210	66	Monostable relay for one inductive/capacitive sensor without amplifier (NAMUR).			
SD 170	SD 270	67	Bistable relay for two inductive/capacitive sensors without amplifier (NAMUR).			

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SE 110		70	Relay for photosensors with modulated, infrared light.
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SE 135		72	Temperature control relay for sensors, type ETS, and variable resistors and diodes.
SE 155		73	Temperature control relay for sensors, type ETS, and variable resistors and diodes.
SE 170		74	Differential relay for servomechanismes. For two external potentiometers, 1–5 kΩ.
SF 110		75	Frequency relay with fixed bandwidth: 6 Hz. Centre frequency: 50 or 60 Hz.
SF 125		76	Frequency relay with variable bandwidth: 1–6 Hz. Centre frequency: 50 or 60 Hz.
SF 140		77	Digital controller for 4-pole wind-driven generators (windmills.).
SF 160		78	Digital controller for 6-pole wind-driven generators (windmills).
SG 125		79	Two state relay controlled by its own supply voltage. Adjustable delay.
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		81	Start attempt and alarm relay for e.g. emergency generator sets.
SH 115		82	Relay for the detection of gases. Detector type HG 10 or HG 20.
SJ 053		83	Analogue panel indicator for AC current metering, 0.2 mA–5A.
SJ 073		84	Analogue panel indicator for AC current metering, 10 – 200 A.
SJ 093		85	Analogue panel indicator for AC voltage metering, 20 – 255 V.
SJ 105		86	Current metering relay, DC. 0.2 mA – 5 A. Internal shunt.
SJ 115		87	Current metering relay, DC. 10 mV – 150 mV. External shunt.
SJ 125		88	Current metering relay, DC. For current transformer (JD) or pressure transducer (JP).
SJ 135		89	Voltage metering relay, DC. 12 mV – 500 V.
SJ 155		90	Current metering relay, AC. 0.2 mA – 5 A. Internal shunt.
SJ 175		91	Current metering relay, AC 0.2 A – 5 A. For through-primary transformer CT3A.
SJ 185		92	Voltage metering relay, AC. 20 mV – 500 V.
SJ 195		93	Voltage metering relay, AC. Knob-adjustable trip point 20 V – 260 V, and hysteresis.
SJJ 195		94	Voltage metering relay, AC. Upper and lower limits separately adjusted, 20 V – 260 V.
SL 100		95	Logic relay. OR/NOR/AND/NAND. 5 inputs: Internal control voltage.
SL 110		96	Logic relay. OR. 3 inputs: Internal/external control voltage.
SL 120		97	Logic relay. NOR. 3 inputs: Internal/external control voltage.
SL 130		98	Logic relay. AND. 3 inputs: Internal/external control voltage.
SL 140		99	Logic relay. NAND. 3 inputs: Internal/external control voltage.
SL 150		100	Logic relay. Flip-flop. 1 input: Internal control voltage.
SL 160		101	Logic relay. Flip-flop, memory. 1 input: Internal control voltage.
SL 170		102	Logic relay. Bistable. 2 inputs: Internal control voltage.
SL 180		103	Logic relay. Bistable, memory. 2 inputs: Internal control voltage.
SL 190		104	Logic relay. OR/NOR/AND/NAND. 5 inputs: External control voltage.
SM 100		105	Pulse-continuity relay. Start on impulse. External setting: 0.15 s – 600 s.
SM 105		105	Pulse-continuity relay. Start on impulse. Knob-adjustable: 0.15 s – 600 s.
SM 115		106	Current metering relay, AC 0.1 A – 500 A. For transformer, type MI/MP.
SM 125		107	Voltage metering relay, AC/DC. 0.1 V – 500 V.
SM 155		108	Tachometer relay. Knob-adjustable: 30 – 10,000 revolutions/pulses pr minute.
SM 170		109	Phase failure relay measuring on its own 3-phased supply voltage.
SM 180		110	Phase failure relay measuring on its own 3-phased supply voltage.
SM 190		111	Phase failure relay. Measures on current. For transformer, type MI 3XXX.
SO 115		112	Relay for relative wind direction. For electronic wind vane, type OD 02.
SP 042		113	Pulse counter with 3-digit LED display. Compatible with SP 149.
SP 052		114	3-digit counter with LED display for pulses per self-selected periode.
SP 100		115	Pulse-continuity relay. Start on connection of supply voltage. External setting.
SP 105		115	Pulse-continuity relay. Start on connection of supply voltage. Knob-adjustable.
SP 115		116	Wind velocity relay. For conjunction with anemometer, type PV 01.
SP 129	SP 229	117	Pulse dividing relay. Digital setting: 2 – 99 pulses.
SP 139	SP 239	118	Pulse dividing relay. Digital setting: 2 – 999 pulses.
SP 149		119	Pulse pre-selection relay. Digital setting: 2 – 999 pulses.

INDEX

TYPE No. — FUNCTION

TYPE No.		PAGE	FUNCTION
SPDT	DPDT		
SR 110		120	Coincidence relay for two external contacts.
ST 010		121	Amplifier for temperature sensors, type ETR. No output relay. -20 to +120°C.
ST 020		122	Amplifier for temperature sensors, type Pt 100. No output relay. -50 to +850°C.
ST 030		123	Amplifier for temperature sensors, type Ni 100. No output relay. -60 to +180°C.
ST 040		124	Amplifier for temperature sensors, type ETS. No output relay. -20 to +120°C.
ST 100		125	Relay for temperature sensors, type ETS. External setting: -20 to +120°C.
ST 105		125	Relay for temperature sensors, type ETS. Knob-adjustable: -20 to +120°C.
ST 115		126	Temperature control relay for sensors, type ETR. Knob-adjustable: -20 to +120°C.
ST 119		127	Temperature control relay for sensors, type ETR. Digital setting: -20 to +120°C.
ST 125		128	Temperature control relay for sensors, type Pt 100. Knob-adjustable: -50 to +850°C.
ST 135		129	Temperature control relay for sensors, type Ni 100. Knob-adjustable: -60 to +180°C.
ST 139		130	Temperature control relay for sensors, type Ni 100. Digital setting: -60 to +180°C.
ST 145		131	Difference relay for temperature sensors, type ETS. Knob-adjustable: -20 to +120°C.
ST 155		132	Temperature control relay for Fe-Ko thermocouples. Knob-adjustable: 50 to 600°C.
ST 165		133	Temperature control relay for NiCr-Ni thermocouples. Knob-adjustable: 50 to 1300°C.
ST 175		134	Difference relay for temperature sensors, type ETS. Knob-adjustable: -20 to +120°C.
ST 185		135	Temperature difference relay for sensors, type ETR. Knob-adjustable: -20 to +120°C.
ST 199		136	Temperature control relay for sensors, type Pt 100. Digital setting: 0 to 900°C.

SV 110	SV 210	137	Level control relay for discharging of conductive liquids.
SV 115	SV 215	138	Level control relay for discharging of conductive liquids. Adjustable.
SV 120	SV 220	139	Level control relay for charging of conductive liquids.
SV 125	SV 225	140	Level control relay for charging of conductive liquids. Adjustable.
SV 150	SV 250	141	Level control relay for liquids or granulates. Sensors, type VR, VRY.
SV 180	SV 280	142	Level control relay for swimming pools. Sensor, type VJ 1.
SV 190		143	Level control relay for liquids or granulates. Sensors, type DP, DR, VP.

SY 115		144	Load guard for asynchronous motors. Knob-adjustable: $\cos \varphi = 0$ to 0.9
SY 125		145	Power metering and power direction relay. Knob-adjustable: 0.27 to 125 kW.
SY 145		146	Relay for phase asymmetry. Knob-adjustable: 5 to 15%.
SY 155		147	Voltage metering relay. Measures on its own 3-phased supply voltage and neutral.
SY 165		148	Voltage metering relay. Measures on its own 3-phased supply voltage.
SY 185		149	Phase angle relay. Knob-adjustable phase angle error: 5 to 15°.
SY 155		150	Voltage metering relay. Knob-adjustable upper and lower limits: 104 to 260 V.

ACCESSORIES

BB 1	152	Cover for terminals of bases, type S 108, S 111, S 108 A, S 111 A.
BB 4	152	Cover for bases, type S 408, S 411.
FRS 2	151	Front mounting bezel for panel mounting of S-systems.
HF	152	Hold down spring for additional fixing of S-systems.
PK	153	Remote potentiometer kit. (External potentiometer with front plate.)
PL 1	152	Potentiometer lock. For knob-adjustable S-systems.
S 008	151	8-pole base for printed circuits.
S 011	151	11-pole base for printed circuits.
S 108	151	8-pole base with soldering- and plug connections. For chassis mounting.
S 111	151	11-pole base with soldering- and plug connections. For chassis mounting.
S 108 A	151	8-pole base for printed circuits. For chassis mounting.
S 111 A	151	11-pole base for printed circuits. For chassis mounting.
S 408	151	8-pole base for screw or snap-mounting. Captive cable clamps and cross cut terminal screws.
S 411	151	11-pole base for screw or snap-mounting. Captive cable clamps and cross cut terminal screws.
S 908	151	8-pole base for screw or snap-mounting.
S 911	151	11-pole base for screw or snap-mounting.
SM 13	152	Mounting rack for up to 27 S-systems.
ST	153	Transformers for up to 40 S-systems. Primary 220/380 VAC. Secondary: 24 VAC.

COMMON TECHNICAL DATA

SUPPLY VOLTAGE

SUPPLY VOLTAGE DC

24 VDC \pm 10% – Pin 2 positive – Polarity protected.
Electronic circuit is not galvanically separated from the supply voltage.

SUPPLY VOLTAGE AC

24, 120 or 220 VAC \pm 10%. 45–65 Hz.
The S-systems for AC supply voltage are equipped with built-in transformer for galvanically separating the electronic circuit and the supply voltage.
Test voltage: 2000 VAC.

POWER CONSUMPTION

DC Supply: Approx. 1.5 W.
AC Supply: Approx. 2.5 VA.

DURATION OF CONNECTION

100%.

SUPPLY INTERRUPTIONS

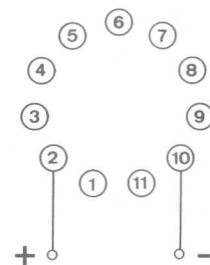
The S-systems will not react to supply voltage interruptions of less than 2 cycles.

VOLTAGE STABILIZATION

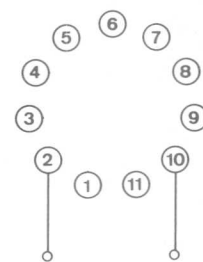
The S-systems incorporate voltage stabilization.

TRANSIENT PROTECTION

3 kV.



DC supply voltage



AC supply voltage

SUPPLY CONNECTIONS Socket view.

OUTPUT CONTACTS

CONTACT RATINGS AC

SPDT: 300 VAC – 10 A – 2500 VA, resistive load.
DPDT: 300 VAC – 5 A – 1250 VA, resistive load per contact.

CONTACT RATINGS DC

SPDT: 250 VDC – 1 A – 250 W or 25 VDC – 10 A – 250 W.
DPDT: 250 VDC – 0.4 A – 100 W or 25 VDC – 4 A – 100 W per contact.

MECHANICAL LIFE

30 mill. operations.

ELECTRICAL LIFE

250,000 operations. (At max. load).

MAX. OPERATIONAL SPEED

7,200 operations/h.

CONTACT MATERIAL

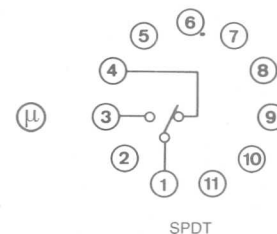
AgCdO (90/10)

AIR GAP

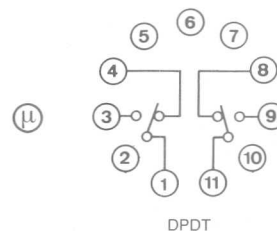
<3 mm (microgap switch)

CONTACT ISOLATION

All output contacts are galvanically separated from the supply voltage and from the electronic circuit.
Test voltage: 2000 VAC.



SPDT



DPDT

CONTACT CONNECTIONS Socket view.

COMMON TECHNICAL DATA

AMBIENT TEMPERATURE

Operating: -20°C to $+50^{\circ}\text{C}$. (-4°F to $+122^{\circ}\text{F}$).
Storage: -50°C to $+85^{\circ}\text{C}$. (-58°F to $+185^{\circ}\text{F}$).

MATERIAL

Housing: NORYL SE 1.
Socket pins: Nickel-plated brass.

WEIGHT

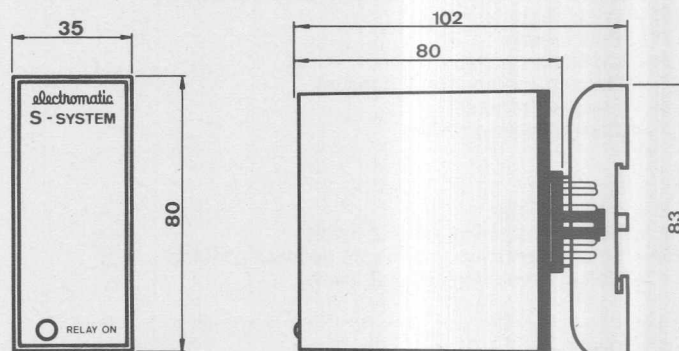
DC supply voltage: Approx. 125 grams.
AC supply voltage: Approx. 200 grams.

COLOUR

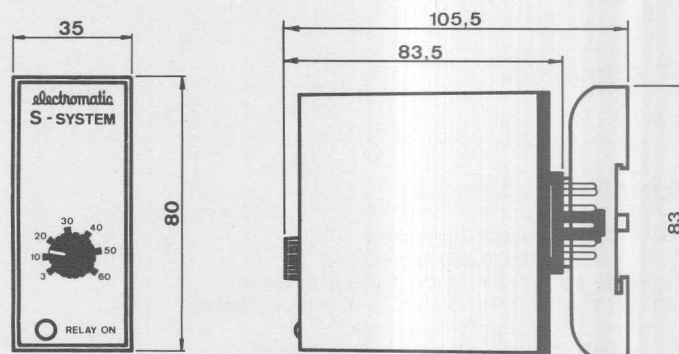
Housing: Light grey.
Socket: Black.

EXTERNAL DIMENSIONS (mm)

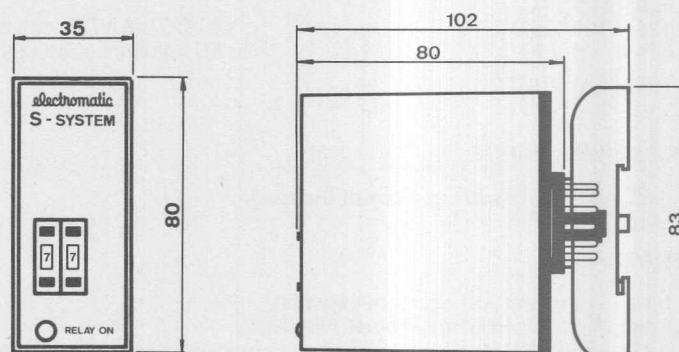
Without potentiometer



With 1 or 2 potentiometers or
with 1 potentiometer and 1 rotary switch.



With 2 or 3 digital switches.



ORDERING KEY

EXAMPLE

S

A

B

C

1

0

7

220

60

m

SYSTEM TYPE

S-SYSTEM

OPERATION

A – Delay on operate.
B – Interval timer & delay on release.
C – Recycler & Interval timer.
D – Relay for NAMUR sensors.
E – Relay for photosensors.
F – Frequency relay.
G – Dual function relay.
H – Relay for gas detectors.
J – Current/voltage metering relay.
L – Logic relay.
M – Current/voltage relay & pulse-countinuity relay.
O – Wind direction relay.
P – Pulse relay.
R – Coincidence relay.
T – Relay for temperature sensors.
V – Level control relay.
Y – Current/voltage relay.

B – Interval timer.
J – Voltage metering relay: 2 levels.
M – One instantaneous and one delayed contact.
Y – Voltage metering relay: 2 levels.

C – Recycler.

CONTACT

0 – Without output relay.
1 – SPDT
2 – DPDT

INT. CIRCUIT NO.

0 – 9

METHOD OF ADJUSTMENT

0 – No or external adjustment.
1 – No or external adjustment.
2 – No adjustment. With LED digital display.
3 – No adjustment. With LED analogue display.
5 – With 1 or 2 potentiometers.
7 – With potentiometer and rotary switch.
9 – Digital setting.

SUPPLY VOLTAGE

380 – 380 VAC (3 phases)
220 – 220 VAC
120 – 120 VAC
024 – 24 VAC
724 – 24 VDC

12 VDC, 48 VDC, and other
AC voltages upon request.

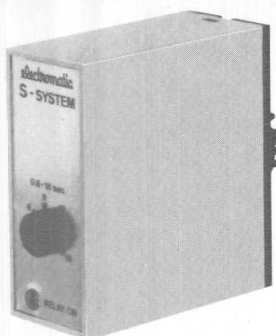
MEASURING RANGE

Just state the maximum value of the range.

DESIGNATION

Hz – Pulses/activations per second.
r.p.m. – Revolutions/pulses per minute.
s – Seconds.
m – Minutes
h – Hours.

12



SA 105/205
Knob-adjustable

SA 105/205

- * Delay on operate to 600 secs.
- * Automatic start.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10–12.

Time ranges

0.15–	3 s
0.8 –	18 s
3 –	60 s
8 –	180 s
30 –	600 s.

Range accuracy
+ 5 % on max.
– 10 % on min.

Repeatability
 $\pm 1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 2\%$.

Reset of time and/or relay

Occurs by disconnecting the supply voltage for min. 300 ms.

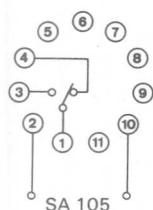
Time adjustment SA 105/205

Knob-adjustable with scale in seconds.
Scale accuracy: $\pm 10\%$.

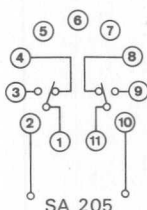
Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



SA 105



SA 205

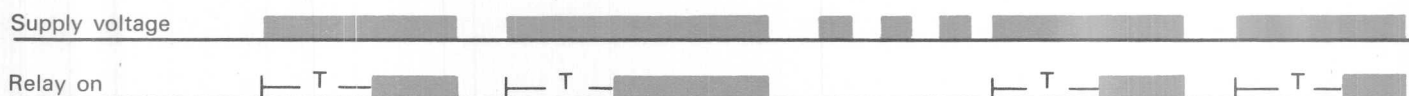
MODE OF OPERATION

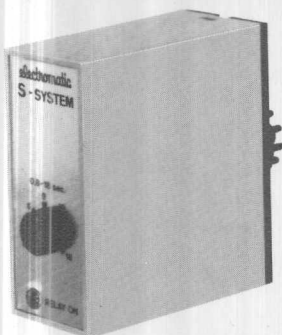
The delay period begins when the supply voltage is applied. At the end of the set delay the relay will operate and will not release until the supply voltage is disconnected.

After removal of the supply voltage a recovery time of 300 ms should be allowed before the S-system is activated again.

If the supply voltage is removed for more than 300 ms before the relay operates, the time circuit resets and the S-system is ready for a new timing period.

OPERATION DIAGRAM





SA 115/215
Knob-adjustable

SA 115/215

- * Delay on operate to 600 secs.
- * Automatic start. Reset of time or relay with built-in NPN output transistor with open collector.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

S
A

SPECIFICATIONS

Common technical data and ordering key Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
30 - 600 s.

Range accuracy

+ 5 % on max.
- 10 % on min.

Repeatability

$\pm 1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 2\%$.

Reset of time and/or relay

Occurs by interconnecting pins 5 and 7 for min. 10 ms, either by a metallic contact or by a proximity sensor (E-models), or by disconnecting the supply voltage for min. 300 ms.

Time adjustment SA 115/215

Knob-adjustable with scale in seconds.
Scale accuracy: $\pm 10\%$.

Power output for proximity sensor

Pin 6: + 24 VDC.
Use proximity sensor with built-in NPN output transistor with open collector.
Connect (+) to pin 6, (-) to pin 7, and (out) to pin 5.

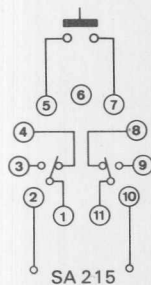
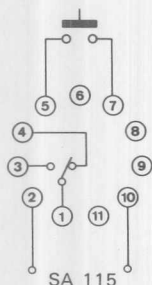
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

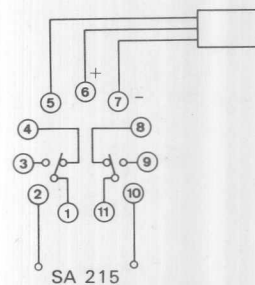
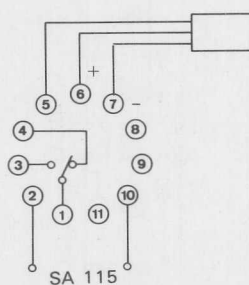
Inductive, capacitive or optical proximity sensors with built-in NPN output transistor with open collector.
See catalogue on accessories.

WIRING DIAGRAMS

Example 1
With metallic contact



Example 2
Proximity sensor with amplifier



MODE OF OPERATION

Example 1

The delay period begins when the supply voltage is applied. At the end of the set period, the relay will operate and will not release until the supply voltage is disconnected.

After removal of the supply voltage a recovery time of 300 ms should be allowed before the S-system is activated again.

By interconnecting pins 5 and 7 for minimum 10 ms during the delay period, the time is reset.

A new delay period begins when pins 5 and 7 are again disconnected.

When a delay period has elapsed, it is possible to reset the relay to OFF-position by interconnecting pins 5 and 7.

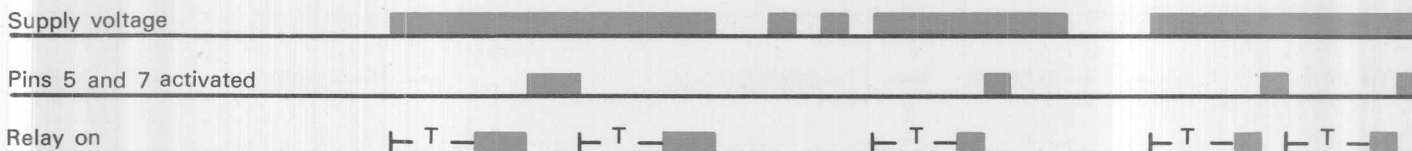
A new delay period begins when pins 5 and 7 are again disconnected.

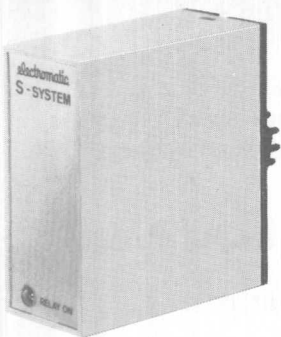
Example 2

Mode of operation as described in example 1.

However, in example 2, the metallic contact is replaced by an inductive, capacitive or optical proximity sensor with built-in amplifier, which is powered from pin 6. (+ 24 VDC).

OPERATION DIAGRAM





SA 140/240
External resistor
adjustable

SA 140/240

- * Delay on operate to 180 hours.
- * Automatic start.
- * External resistor adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

**Common technical data
and ordering key**
Pages 10–12.

Time ranges

- 0.15– 3 s
- 0.8 – 18 s
- 3 – 60 s
- 8 –180 s
- 0.5 – 10 m
- 3 – 60 m
- 8 –180 m
- 0.5 – 10 h
- 3 – 60 h
- 8 –180 h.

Range accuracy
 $+ 5\%$ on max.
 $- 10\%$ on min.

Repeatability
 $\pm 0.1\%$.

Max. time variation
Within the limits of rated
supply voltage and ambient
temperature:
 $\pm 1\%$.

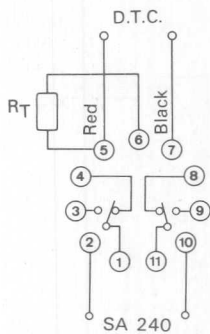
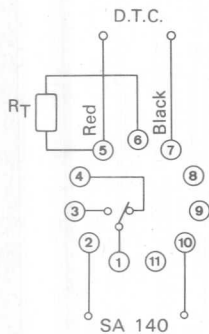
**Reset of time
and/or relay**
Disconnection of supply vol-
age for min. 100 ms.

Time adjustment
SA 140/240
External resistor or linear re-
mote potentiometer R_T .
0–1 M Ω , 0.25 W.
The external resistor must be
connected before the S-sy-
stem will operate.

Accessories
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.
Remote potentiometer kit.

Digital Timer Control
Connection for Digital Timer
Control (D.T.C.) between pins
5 and 7.
Pin 5 positive.
See catalogue on accessories.

WIRING DIAGRAMS

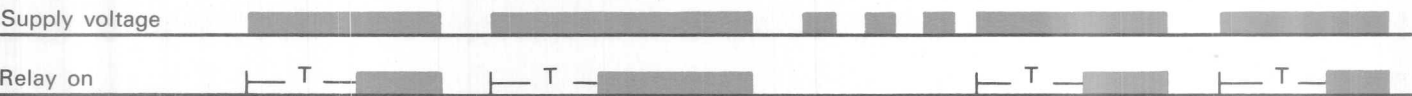


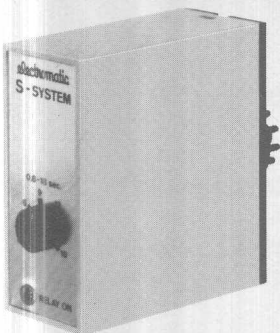
MODE OF OPERATION

The delay period begins when the supply voltage is applied. At the end of the set delay, the relay will operate and will not release until the supply voltage is disconnected. After removal of the supply voltage a recovery time of 100 ms should be allowed before the S-system is activated again.

If the supply voltage is removed for more than 100 ms before the relay operates the time circuit is reset to zero and the S-system is ready for a new timing period.

OPERATION DIAGRAM





SA 145/245
Knob-adjustable

SA 145/245

- * Delay on operate to 180 hours.
- * Automatic start.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

S
A

SPECIFICATIONS

Common technical data and ordering key

Pages 10–12.

Time ranges

0.15–	3 s
0.8 –	18 s
3 –	60 s
8 –	180 s
0.5 –	10 m
3 –	60 m
8 –	180 m
0.5 –	10 h
3 –	60 h
8 –	180 h

Range accuracy

+ 5 % on max.
– 10 % on min.

Repeatability

$\pm 0.1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 1\%$.

Reset of time and/or relay

Disconnection of supply voltage for min. 100 ms.

Time adjustment SA 145/245

Knob-adjustable with scale in seconds, minutes or hours.
Scale accuracy: $\pm 10\%$.

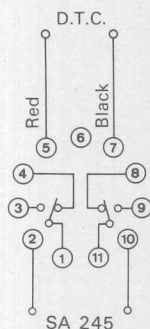
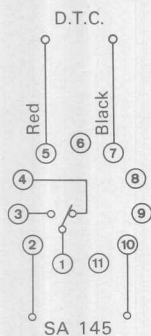
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Digital Timer Control

Connection for Digital Timer Control (D.T.C.) between pins 5 and 7.
Pin 5 positive.
See catalogue on accessories

WIRING DIAGRAMS



MODE OF OPERATION

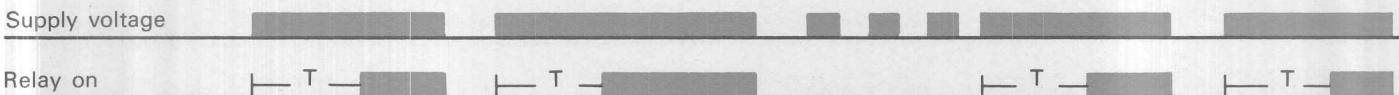
The delay period begins when the supply voltage is applied.

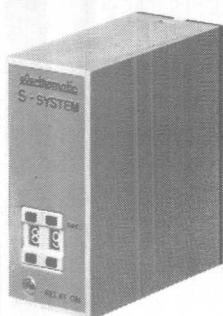
At the end of the set delay, the relay will operate and will not release until the supply voltage is disconnected.

After removal of the supply voltage a recovery time of 100 ms should be allowed before the system is activated again.

If the supply voltage is removed for min. 100 ms before the relay operates, the time circuit is reset to zero and the S-system is ready for a new timing period.

OPERATION DIAGRAM





SA 149/249
Digital switch
adjustable

SA 149/249

- * Delay on operate to 99 hours.
- * Automatic start.
- * Digital switch-adjustable.
- * Quartz-controlled digital timing circuit.
- * Repeatability: $\pm 0.005\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

**Common technical data
and ordering key**
Pages 10-12.

Time ranges

0.1- 9.9 s
1 -99 s
0.1- 9.9 m
1 -99 m
0.1- 9.9 h
1 -99 h.

Setting accuracy
100 %.

Repeatability
 $\pm 0.005\%$.

Max. time variation

Within the limits of rated
supply voltage and ambient
temperature:
 $\pm 0.01\%$.

Reset of time and/or relay

Disconnection of supply vol-
tage for min. 100 ms.

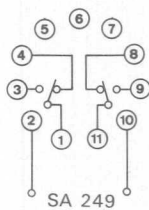
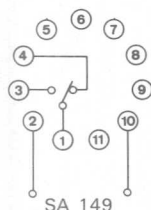
Time adjustment
SA 149/249

2-digit built-in time selector.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

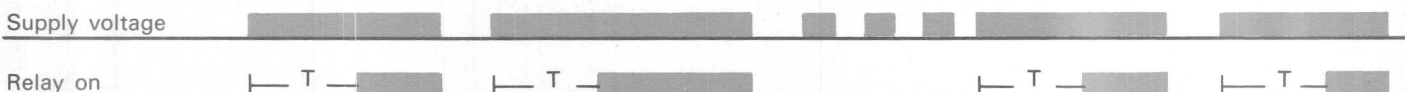


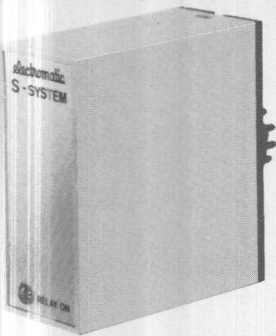
MODE OF OPERATION

The delay period begins when the supply
voltage is applied.
At the end of the set delay, the relay will
operate and will not release until the
supply voltage is disconnected.
After removal of the supply voltage a re-
covery time of 100 ms should be allow-
ed before the system is activated again.

If the supply voltage is removed for
more than 100 ms before the relay
operates the time circuit resets and the
S-system is ready for a new timing pe-
riod.

OPERATION DIAGRAM





SA 160
External resistor
adjustable

SA 160

- * Delay on operate to 180 hours.
- * Automatic start. Reset of time and/or relay by contact.
- * External resistor adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SA

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
0.5 - 10 m
3 - 60 m
8 - 180 m
0.5 - 10 h
3 - 60 h
8 - 180 h

Range accuracy

+ 5% on max.
- 10% on min.

Repeatability

$\pm 0.1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 1\%$.

Reset of relay

Occurs by interconnecting pins 5 and 7.
24 VDC - 5 mA.
Pin 5 positive.
Pulse duration: Min. 10 ms.

Reset of time

Occurs by interconnecting pins 6 and 7.
24 VDC - 10 mA.
Pin 6 positive.
Pulse duration: Min. 10 ms.

Time adjustment SA 160

External resistor or linear remote potentiometer R_T .
0-1 M Ω , 0.25 W.
The external resistor must be connected before the S-system will operate.

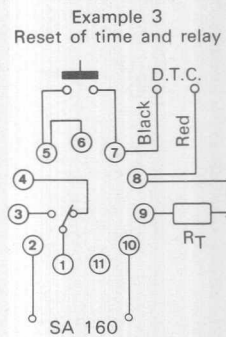
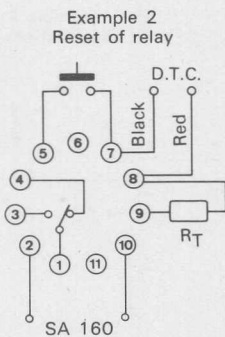
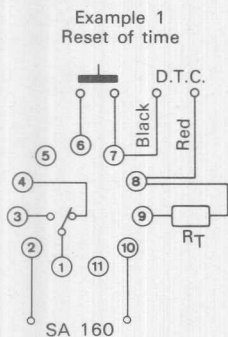
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.
Remote potentiometer kit.

Digital Timer Control

Connection for Digital Timer Control (D.T.C.) between pins 7 and 8.
Pin 8 positive.
See catalogue on accessories.

WIRING DIAGRAMS



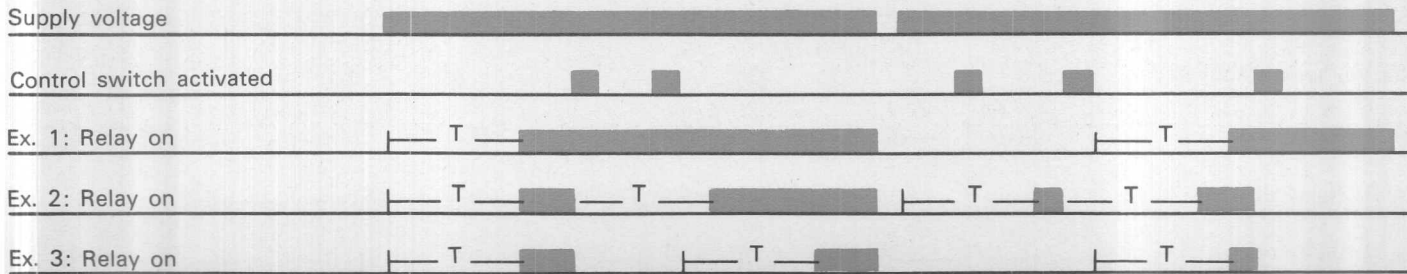
MODE OF OPERATION

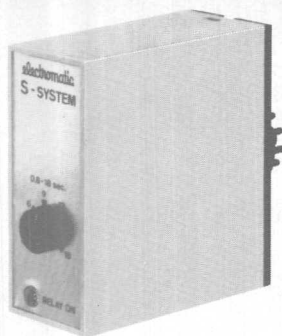
Example 1: The delay period begins when the supply voltage is applied. At the end of the set delay, the relay will operate and will not release until the supply voltage is disconnected. Closure of the contact function before the relay has operated causes the time to be zero-set and the period is now calculated from the break of the connection between pins 6 and 7. After removal of the supply voltage a recovery time of 100 ms should be allowed before the S-system is activated again.

Example 2: The delay period begins when the supply voltage is applied. At the end of the set delay, the relay will operate. Closure of the contact function causes the relay to release and the function is repeated irrespective of whether pin 5 is still connected to pin 7.

Example 3: The delay period begins when the supply voltage is applied. At the end of the set delay, the relay will operate. Closure of the contact function (pins 5-7) before the relay has operated causes the time to reset and the delay is now calculated from the break of the connection between pins 5 and 7. Closure of the contact function after the relay has operated causes the relay to release and a new delay is calculated from the break of the connection between pins 5 and 7.

OPERATION DIAGRAM





SA 165
Knob-adjustable

SA 165

- * Delay on operate to 180 hours.
- * Automatic start.
- * Reset of time and/or relay with contact.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
0.5 - 10 m
3 - 60 m
8 - 180 m
0.5 - 10 h
3 - 60 h
8 - 180 h.

Range accuracy
+ 5 % on max.
- 10 % on min.

Repeatability
 $\pm 0.1\%$.

Max time variation
Within the limits of rated supply voltage and ambient temperature:
 $\pm 1\%$.

Reset of relay
Occurs by interconnecting pins 5 and 7.
24 VDC - 5 mA.
Pin 5 positive.
Pulse duration: Min. 10 ms.

Reset of time
Occurs by interconnecting pins 6 and 7.
24 VDC - 10 mA.
Pin 6 positive.
Pulse duration: Min. 10 ms.

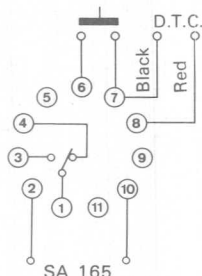
Time adjustment SA 165
Knob-adjustable with scale in seconds, minutes or hours.
Scale accuracy: $\pm 10\%$.

Accessories
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

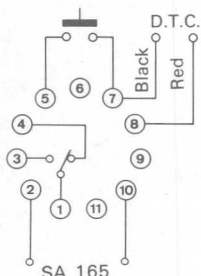
Digital Timer Control
Connection for Digital Timer Control (D.T.C.) between pins 7 and 8.
Pin 8 positive.
See catalogue on accessories.

WIRING DIAGRAMS

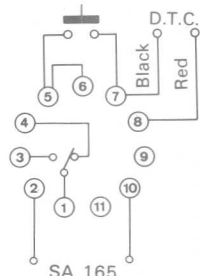
Example 1
Reset of time



Example 2
Reset of relay



Example 3
Reset of time and relay



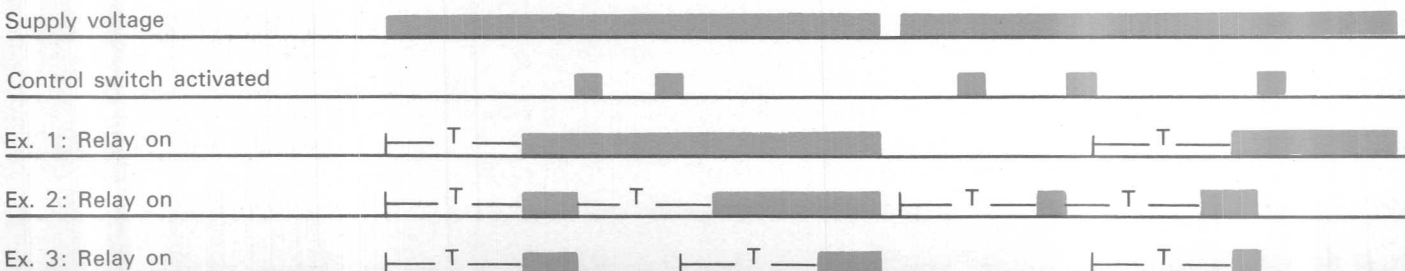
MODE OF OPERATION

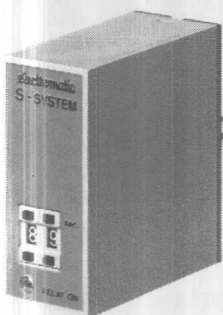
Example 1. The delay period begins when the supply voltage is applied. At the end of the set delay, the relay will operate and will not release until the supply voltage is disconnected. Closure of the contact function before the relay has operated causes the time to reset and the period is now calculated from the break of the connection between pins 6 and 7. After removal of the supply a recovery time of 100 ms should be allowed before the system is activated again.

Example 2. The delay period begins when the supply voltage is applied. At the end of the set delay, the relay will operate. Closure of the contact function causes the relay to release and the function is repeated irrespective of whether pin 5 is still connected to pin 7.

Example 3. The delay period begins when the supply voltage is applied. At the end of the set delay, the relay will operate. Closure of the contact function before the relay has operated causes the time to reset and the delay is now calculated from the break of the connection between pins 5 and 7. Closure of the contact function after the relay has operated causes the relay to release and a new delay is calculated from the break of the connection between pins 5 and 7.

OPERATION DIAGRAM





SA 169/269
Digital switch
adjustable

SA 169/269

- * Delay on operate to 99 hours.
- * Automatic start. Reset of time and/or relay with contact.
- * Digital switch-adjustable.
- * Quartz-controlled digital timing circuit.
- * Repeatability: $\pm 0.005\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SA

SPECIFICATIONS

Common technical data and ordering key
Pages 10–12.

Time ranges

0.1– 9.9 s
1 –99 s
0.1– 9.9 m
1 –99 m
0.1– 9.9 h
1 –99 h.

Setting accuracy
100 %.

Repeatability
 $\pm 0.005\%$.

Max. time variation
Within the limits of rated supply voltage and ambient temperature:
 $\pm 0.01\%$.

Reset of relay
Occurs by interconnecting pins 5 and 7.
24 VDC - 5 mA.
Pin 5 positive.
Pulse duration: Min. 10 ms.

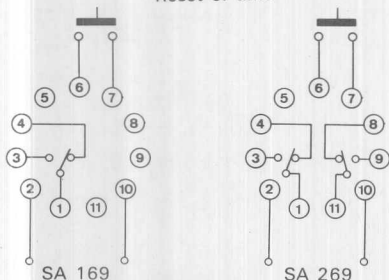
Reset of time
Occurs by interconnecting pins 6 and 7.
24 VDC - 10 mA.
Pin 6 positive.
Pulse duration: Min. 10 ms.

Time adjustment
SA 169/269
2-digit built-in time selector.

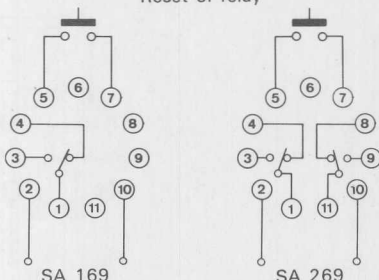
Accessories
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

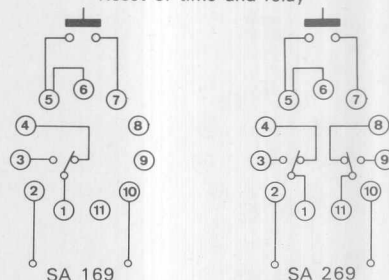
Example 1
Reset of time



Example 2
Reset of relay



Example 3
Reset of time and relay



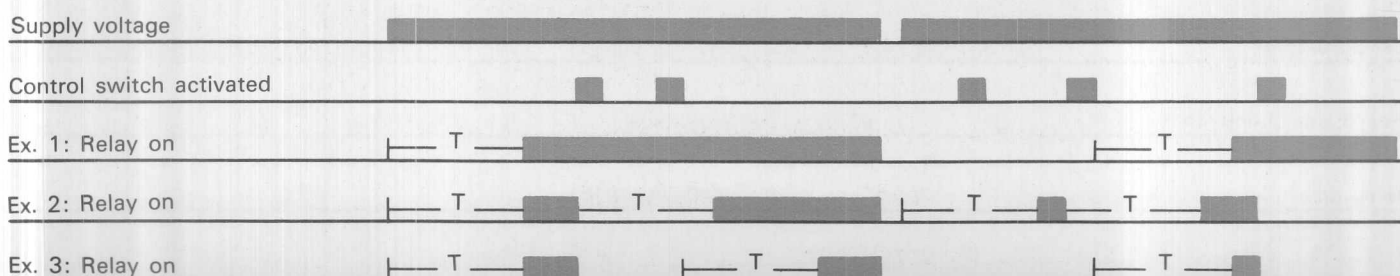
MODE OF OPERATION

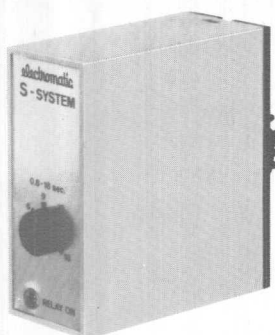
Example 1: The delay period begins when the supply voltage is applied. At the end of the set delay, the relay will operate and will not release until the supply voltage is disconnected. Closure of the contact function before the relay has operated causes the time to reset and the period is now calculated from the break of the connection between pins 6 and 7. After removal of the supply voltage a recovery time of 100 ms should be allowed before the system is activated again.

Example 2: The delay period begins when the supply voltage is applied. At the end of the set delay the relay will operate. Closure of the contact function causes the relay to release and the function is repeated irrespective of whether pin 5 is still connected to pin 7.

Example 3: The delay period begins when the supply voltage is applied. At the end of the set delay, the relay will operate. Closure of the contact function before the relay has operated causes the time to reset and the delay is now calculated from the break of the connection between pins 5 and 7. Closure of the contact function after the relay has operated causes the relay to release and a new delay is calculated from the break of the connection between pins 5 and 7.

OPERATION DIAGRAM





SA 175/275
Knob-adjustable

SA 175/275

- * Delay on operate to 600 sec.
- * Pulse-controlled start with metallic contact or proximity sensor with built-in NPN output transistor with open collector.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15	-	3 s
0.8	-	18 s
3	-	60 s
8	-	180 s
30	-	600 s

Range accuracy
+ 5 % on max.
- 10 % on min.

Repeatability
 $\pm 1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 2\%$.

Start of delay period

Occurs by interconnecting pins 5 and 7 for min. 10 ms, either by a metallic contact or by a proximity sensor with built-in amplifier.

Reset of time and/or relay

By disconnecting the supply voltage for min. 300 ms.

Time adjustment

SA 175/275

Knob-adjustable with scale in seconds.

Scale accuracy: $\pm 10\%$.

Power output for proximity sensor

Pin 6: + 24 VDC.

Use proximity sensor with built-in NPN output transistor with open collector.

Connect (+) to pin 6, (-) to pin 7, and (out) to pin 5.

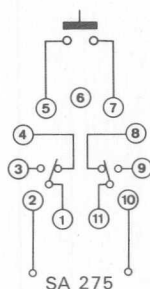
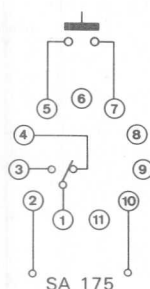
Accessories

Bases.
Holding down spring.
Mounting rack.
Base covers.
Front mounting bezel.

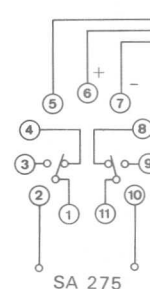
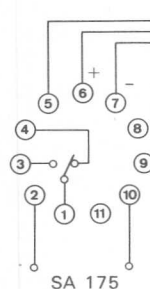
Inductive, capacitive or optical proximity sensors with built-in NPN output transistor with open collector.
See catalogue on accessories.

WIRING DIAGRAMS

Example 1
With metallic contact



Example 2
Proximity sensor with amplifier



MODE OF OPERATION

Example 1

Apply the supply voltage.

The delay circuit is activated when pins 5 and 7 are interconnected by a metallic contact.

The relay operates after expiration of the set time, and remains operated until the supply voltage is disconnected.

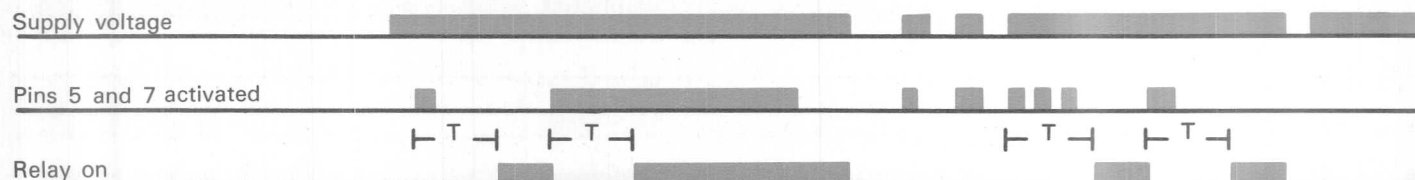
After removal of the supply voltage a recovery time of 300 ms should be allowed before the S-system is activated again. When the set time has elapsed, the relay can be reset to OFF-position by interconnecting pins 5 and 7, whereby the delay circuit is again activated.

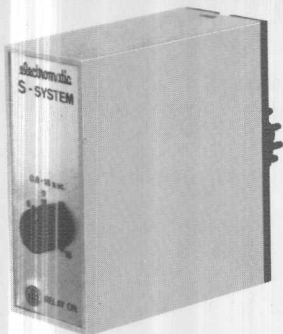
Example 2

Mode of operation as described in example 1.

However, in example 2, the metallic contact is replaced by an inductive, capacitive or optical proximity sensor with built-in amplifier, which is powered from pin 6. (+ 24 VDC).

OPERATION DIAGRAM





SA 185/285
Knob-adjustable

SA 185/285

- * Delay on operate to 600 secs.
- * Start and reset of time with metallic contact or proximity sensor with built-in NPN output transistor with open collector.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

S
A

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
30 - 600 s.

Range accuracy

+ 5 % on max.
- 10 % on min.

Repeatability

$\pm 1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 2\%$.

Start of time

Occurs by disconnecting pins 5 and 7.

Reset of time or relay

Occurs by interconnection of pins 5 and 7 for min. 10 ms, either by a metallic contact or by a proximity sensor with built-in amplifier, or by removal of the supply voltage for min. 300 ms.

Time adjustment

SA 185/285

Knob-adjustable with scale in seconds.

Scale accuracy: $\pm 10\%$.

Power output

Pin 6: + 24 VDC.

Use proximity sensor with built-in NPN output transistor with open collector.

Connect (+) to pin 6, (-) to pin 7, and (out) to pin 5.

Accessories

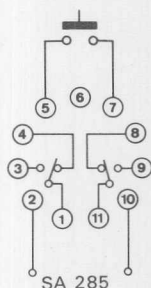
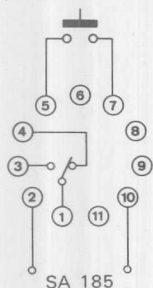
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Inductive, capacitive or optical proximity sensors with built-in NPN output transistor with open collector.

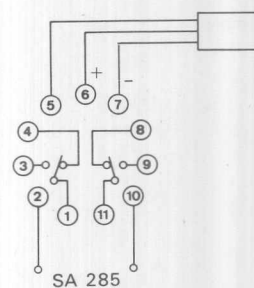
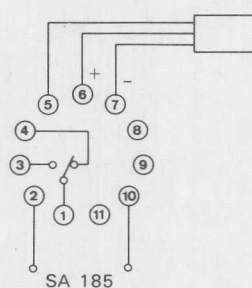
See catalogue on accessories.

WIRING DIAGRAMS

Example 1
With metallic contact



Example 2
Proximity sensor with amplifier



MODE OF OPERATION

Example 1

Apply the supply voltage. The timing period starts when the connection between pins 5 and 7 is interrupted. After expiration of the set delay, the relay operates. Normally the relay remains in operating position until the supply voltage is cut off. By connecting pins 5 and 7 for min. 10 ms during a timing period, the time circuit is reset to zero, and a new full period elapses before the relay operates.

The time is calculated from the rear edge of the pulse. When the relay is in operating position it can be reset by interconnecting pins 5 and 7. A new full period is calculated from disconnection of pins 5 and 7. If the supply voltage is interrupted for 300 ms the S-system is reset to zero and is ready for a new cycle.

Example 2

Same mode of operation as in example 1. Here, however, start or reset of time is executed not with a metallic contact but with an inductive, capacitive or optical proximity sensor with built-in amplifier powered from pin 6 on the relay. (+ 24 VDC).

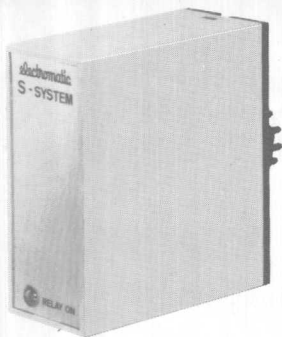
OPERATION DIAGRAM

Supply voltage

Pins 5 and 7 activated

Relay on

T - T - T - T -



SA 190
External resistor
adjustable

SA 190

- * Pulse-controlled delay on operate to 180 hours.
- * Start/reset of time and/or relay with contact.
- * External resistor adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
0.5 - 10 m
3 - 60 m
8 - 180 m
0.5 - 10 h
3 - 60 h
8 - 180 h.

Range accuracy

+ 5% on max.
- 10% on min.

Repeatability

$\pm 0.1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 1\%$.

Start of time and reset of relay

Occurs by interconnecting pins 5 and 7.
24 VDC - 10 mA.
Pin 5 positive.
Pulse duration: Min. 10 ms.

Reset of time

Occurs by interconnecting pins 6 and 7.
24 VDC - 10 mA.
Pin 6 positive.
Pulse duration: Min. 10 ms.

Reset of time and/or relay

Occurs by disconnecting the supply voltage for min 500 ms.

Time adjustment SA 190

External resistor or linear remote potentiometer R_T .
0-1 M Ω , 0.25 W.

The external resistor must be connected before the S-system will operate.

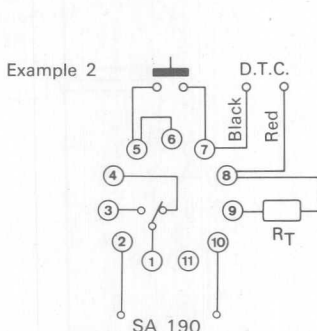
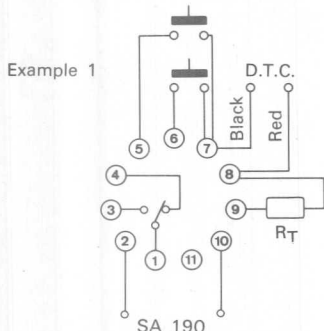
Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.
Remote potentiometer kit.

Digital Timer Control

Connection for Digital Timer Control (D.T.C.) between pins 7 and 8.
Pin 8 positive.
See catalogue on accessories.

WIRING DIAGRAMS



MODE OF OPERATION

Delay on operate, pulse-controlled. Adjustable time, max. 180 hours. Apply the supply voltage. The timing period does not start before a control pulse is given to the S-system. The S-system can be used in 2 different ways:

Example 1

The supply voltage is applied. The delay period starts when pins 5 and 7 are interconnected, and the time elapses whether the pins are still connected or not. After expiry of the set delay the relay will operate. Having disconnected pins 5 and 7, a repetition occurs by reestablishing this in-

terconnection whereby the relay releases. A new timing period starts and the relay operates when the set time has expired.

By interconnecting pins 6 and 7 before the set delay has expired, the time is reset to zero, and a new full timing period is started the instant pins 6 and 7 are again disconnected.

The relay releases when the supply voltage is cut off for min. 500 ms.

Example 2

The supply voltage is applied. Pins 5 and 7 are interconnected. When they are subsequently disconnected the set delay period begins.

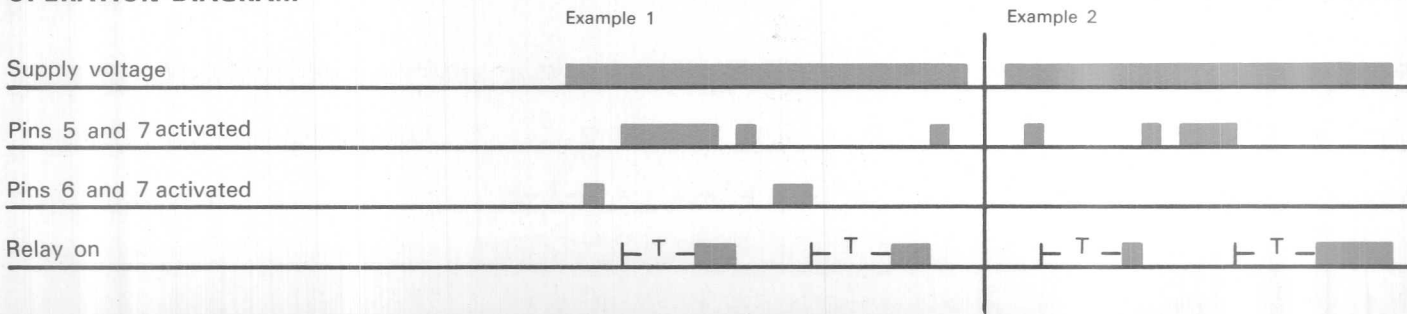
When the set time has expired the relay will operate.

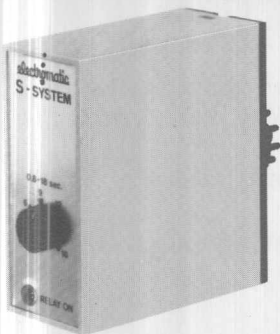
A repetition occurs when pins 5 and 7 are again interconnected whereby the relay releases. A new timing period starts by interruption of the interconnection.

After expiry of the set delay, the relay will operate. When more pulses are given during the timing period the time is reset to zero, and a new full timing period starts counting from the latest disconnection of pins 5 and 7.

The relay releases when the supply voltage is disconnected for min. 500 ms.

OPERATION DIAGRAM





SA 195
Knob-adjustable

SA 195

- * Pulse-controlled delay on operate to 180 hours.
- * Start/reset of time and/or relay with metallic contact.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

S
A

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15	-	3 s
0.8	-	18 s
3	-	60 s
8	-	180 s
0.5	-	10 m
3	-	60 m
8	-	180 m
0.5	-	10 h
3	-	60 h
8	-	180 h

Range accuracy

+ 5% on max.
- 10% on min.

Repeatability

$\pm 0.1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 1\%$.

Start of time and reset of relay

Occurs by interconnecting pins 5 and 7.
24 VDC - 10 mA.
Pin 5 positive.
Pulse duration: Min. 10 ms.

Reset of time

Occurs by interconnecting pins 6 and 7.
24 VDC - 10 mA.
Pin 6 positive.
Pulse duration: Min. 10 ms.

Reset of time and/or relay

Disconnection of supply voltage for min. 500 ms.

Time adjustment SA 195

Knob-adjustable with scale in seconds, minutes or hours.
Scale accuracy: $\pm 10\%$.

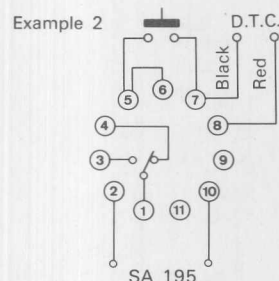
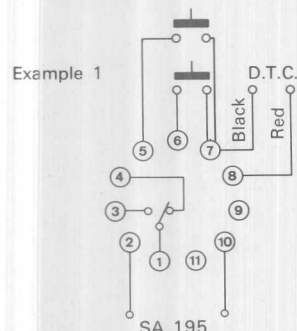
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Digital Timer Control

Connection for Digital Timer Control (D.T.C.) between pins 7 and 8.
Pin 8 positive.
See catalogue on accessories.

WIRING DIAGRAMS



MODE OF OPERATION

Delay on operate, pulse-controlled. Adjustable time, max. 180 hours. Apply the supply voltage. The timing period does not start before a control pulse is given to the S-system. The S-system can be used in 2 different ways:

Example 1

The supply voltage is applied. The delay period starts when pins 5 and 7 are interconnected, and the time elapses irrespective of whether the pins are still connected. After expiry of the set delay the relay will operate. Reconnection of pins 5 and 7 causes the

relay to release and a new timing period to commence.

By interconnecting pins 6 and 7 before the set delay has expired, the time is reset to zero and a new full timing period is started the instant pins 6 and 7 are again disconnected.

The relay releases when the supply voltage is cut off for min. 500 ms.

Example 2

The supply voltage is applied. Pins 5 and 7 are interconnected. When they are subsequently disconnected the set delay period begins. When the set time has expired the relay

will operate.

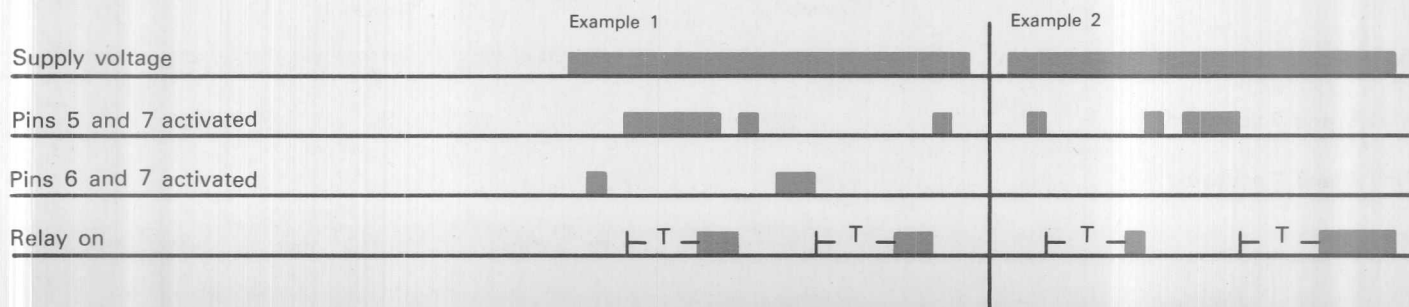
Reconnection of pins 5 and 7 causes the relay to release. A new timing period starts from the break of the connection between pins 5 and 7.

After expiry of the set delay, the relay will operate.

When more pulses are given during the timing period the time is zero-set, and a new full timing period starts counting from the final disconnection of pins 5 and 7.

The relay releases when the supply voltage is interrupted for min. 500 ms.

OPERATION DIAGRAM





SA 199/299
Digital switch
adjustable

SA 199/299

- * Pulse-controlled delay on operate to 99 hours.
- * Start/reset of time and/or relay with contact.
- * Digital switch-adjustable.
- * Quartz-controlled digital timing circuit.
- * Repeatability: $\pm 0.005\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Time ranges

0.1- 9.9 s
1 -99 s
0.1- 9.9 m
1 -99 m
0.1- 9.9 h
1 -99 h.

Setting accuracy
100 %.

Repeatability
 $\pm 0.005\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 0.01\%$.

Start of time and reset of relay

Occurs by interconnecting pins 5 and 7.
24 VDC - 10 mA.
Pin 5 positive.
Pulse duration: Min. 10 ms.

Reset of time

Occurs by interconnecting pins 6 and 7.
24 VDC - 10 mA.
Pin 6 positive.
Pulse duration: Min. 10 ms.

Reset of time and/or relay

Occurs by disconnecting the supply voltage for min. 200 ms.

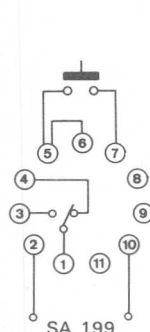
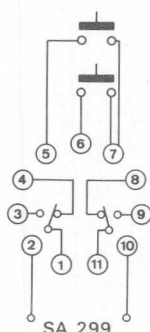
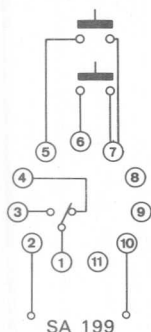
Time adjustment SA 199/299

2-digit switch-adjustable.

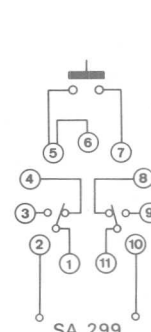
Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



Example 2



MODE OF OPERATION

Delay on operate, pulse-controlled. Adjustable time, max. 99 hours. Apply the supply voltage. The timing period does not start before a control pulse is given to the S-system. The S-system can be used in 2 different ways:

Example 1

The supply voltage is applied. The delay period starts when pins 5 and 7 are interconnected, and the time elapses whether the pins are still connected or not. After expiry of the set delay the relay will operate. Having disconnected pins 5 and 7, a re-

petition occurs by reestablishing this interconnection whereby the relay releases and a new timing period starts.

By interconnecting pins 6 and 7 before the set delay has expired, the time is reset to zero and a new full timing period is started the instant pins 6 and 7 are again disconnected. The relay releases when the supply voltage is interrupted for min. 200 ms.

Example 2

The supply voltage is applied. Pins 5 and 7 are interconnected. When they are subsequently disconnected the set delay period begins.

When the set time has expired the relay will operate.

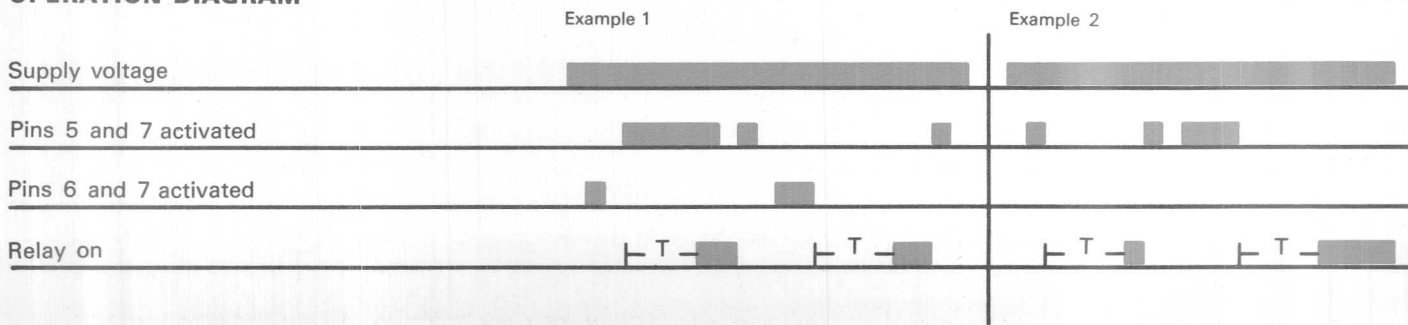
A repetition occurs when pins 5 and 7 are again interconnected whereby the relay releases. A new timing period starts by interruption of the interconnection.

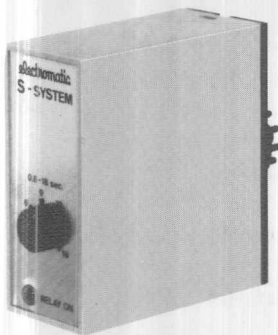
After expiry of the set delay, the relay will operate.

When more pulses are given during the timing period the time is reset to zero, and a new full timing period starts counting from the latest disconnection of pins 5 and 7.

The relay releases when the supply voltage is interrupted for min. 200 ms.

OPERATION DIAGRAM





SAB 115/215
Knob-adjustable

SAB 115/215

- * Programmable time relay to 600 seconds.
- * Automatic start. Reset with contact.
- * Applicable for delay on operate or interval timing.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

S
A

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
30 - 600 s.

Range accuracy

+ 5% on max.
- 10% on min.

Repeatability

$\pm 1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 2\%$.

Reset of time and/or relay

By interconnecting pins 5 and 7, or by interrupting the supply voltage for min. 300 ms.

Time adjustment SAB 115/215

Knob-adjustable with scale in seconds.
Scale accuracy: $\pm 10\%$.

Programming of SAB 115/215

Delay on operate:
Connection between pins 5 and 6.

Interval timer:

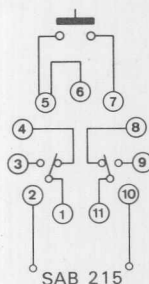
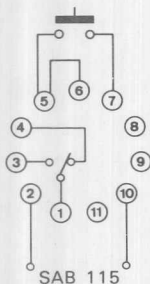
No connection between pins 5 and 6.

Accessories

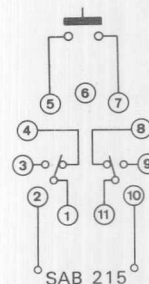
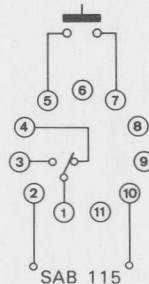
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

Example 1
Delay on operate



Example 2
Interval timing



MODE OF OPERATION

Example 1

Delay on operate:

The delay period begins when the supply voltage is applied.

At the end of the set delay, the relay will operate and not release until the supply voltage is disconnected.

After removal of the supply voltage a recovery time of 300 ms should be allowed before the system is activated again. Closure of the contact function between pins 5 and 7 before the set time has expired causes the time to be zero-set. A new time delay is now calculated from the break of the connection between pins 5 and 7.

When the set time has expired, the relay can be reset by closure of the contact function and a new time period is calculated from the break of the connection between pins 5 and 7.

Example 2

Interval timer:

When supply voltage is applied, the relay operates and the time circuit starts. At the end of the set time, the relay releases.

After removal of the supply voltage a recovery time of 300 ms should be allowed before the system is activated again. Closure of the contact function between pins 5 and 7 before the set time has expired causes the time to be zero-set. A new time delay is now calculated from the break of the connection between pins 5 and 7. When the set time has expired, the relay can be brought to operate again by closure of the contact function. A new time period is calculated from the break of the connection between pins 5 and 7.

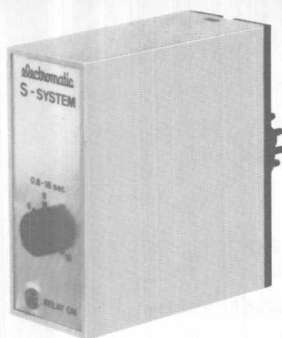
OPERATION DIAGRAM

Supply voltage

Reset pins 5 and 7

Ex. 1: Relay on

Ex. 2: Relay on



SABC 105/205
Knob-adjustable

SABC 105/205

- * Programmable time relay to 600 seconds.
- * Automatic start.
- * Applicable for delay on operate, interval timing and symmetrical recycling.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
30 - 600 s.

Range accuracy

+ 5% on max.
- 10% on min.

Repeatability

$\pm 1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 2\%$.

Reset of time and/or relay

Disconnection of supply voltage for min. 300 ms.

Time adjustment

SABC 105/205
Knob-adjustable with scale in seconds.
Scale accuracy: $\pm 10\%$.

Programming of SABC 105/205

Delay on operate:
Connection between pins 5 and 6.

Interval timer:

Connections between pins 5 - 6 and 7.

Recycler, starting with OFF period:

No connections between pins 5 - 6 and 7.

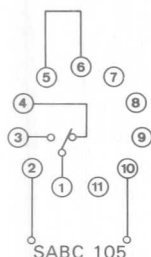
Recycler, starting with ON period:
Connection between pins 6 and 7.

Accessories

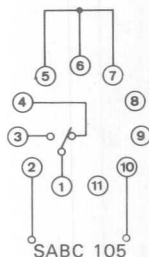
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

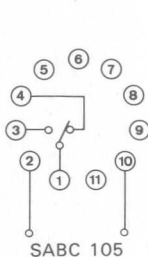
Example 1
Delay on operate



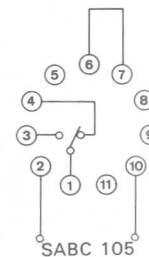
Example 2
Interval timer



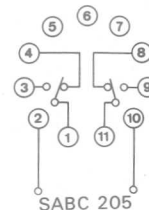
Example 3
Recycler, starting with OFF period



Example 4
Recycler, starting with ON period



DPDT - version
Can be connected as shown in ex. 1 - 2 - 3 and 4



MODE OF OPERATION

Example 1:

Delay on operate: The delay period begins when the supply voltage is applied. At the end of the set delay, the relay will operate and not release again until the supply voltage is disconnected. After removal of the supply voltage a recovery time of 300 ms should be allowed before the system is activated again. If the supply voltage is removed for more than 300 ms before the relay operates the time circuit resets to zero, and the S-system is ready for a new timing period.

Example 2:

Interval timer: The relay operates and the time cycle starts, when supply voltage is applied to the S-system. At the end of the set delay the relay releases, and will not operate again, until the supply voltage is reapplied. A recovery time of 300 ms should be allowed before the system is activated again. If the supply voltage is removed for more than 300 ms before the time has expired, the relay releases and the time is reset to zero.

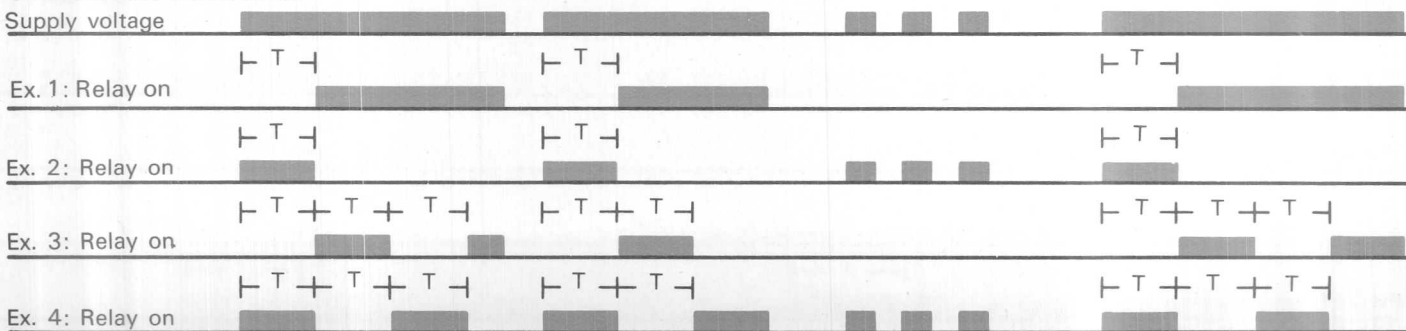
Example 3:

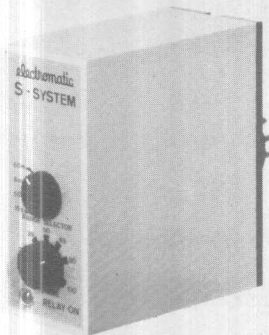
Recycler, starting with OFF period: By connecting the supply voltage the time circuit starts. When the set time expires the relay operates. After expiry of a corresponding period the relay releases. This sequence is continued with EQUAL intervals until the supply voltage is disconnected. If the supply voltage is disconnected the time is reset to zero and a recovery time of 300 ms should be allowed before the system is ready for a new activation.

Example 4:

Recycler, starting with ON period: By connecting supply voltage the relay operates, and when the set time expires the relay releases. After expiry of a corresponding period the relay operates again. This sequence is continued with EQUAL time intervals until the supply voltage is disconnected. If the supply voltage is disconnected the time is reset to zero and a recovery time of 300 ms should be allowed before the system is ready for a new activation.

OPERATION DIAGRAM





SABC 107/207 COMBI
Adjustable with
two knobs

SABC 107/207 COMBI

- * Programmable time relay to 60 minutes.
- * 4 different time ranges: Max. values: 15 s, 60 s, 8 m and 60 m. Selected on upper knob.
- * Continuous setting on lower knob: 2.5 to 100 % of selected time range.
- * 4 different functions: Delay on operate, interval timing and symmetrical recycling.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

S
A

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

4 different time ranges with max. values: 15 s, 60 s, 8 m and 60 m. Selected on upper knob.

Range accuracy

+ 5 % on max.
- 10 % on min.

Max. time variation

Within the limits of rated supply voltage and ambient temperature: $\pm 2\%$.

Repeatability

$\pm 1\%$.

Time adjustment SABC 107/207 COMBI

Continuous setting: 2.5 to 100 % of selected time range. Adjusted on lower knob. Scale accuracy: $\pm 10\%$.

Reset of time and/or relay

Disconnection of supply voltage for min. 300 ms.

Programming of SABC 107/207 COMBI

Delay on operate: Connection between pins 5 and 6.

Interval timer:

Connections between pins 5 - 6 and 7.

Recycler, starting with OFF period:

No connections between pins 5 - 6 and 7.

Recycler, starting with ON period:

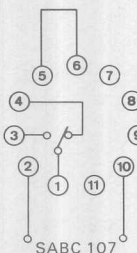
Connection between pins 6 and 7.

Accessories

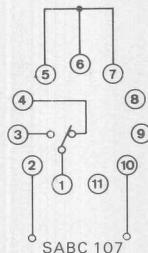
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

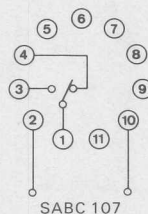
Example 1
Delay on operate



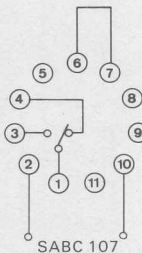
Example 2
Interval timer



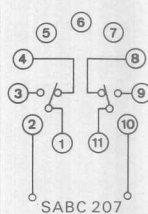
Example 3
Recycler, starting with OFF period



Example 4
Recycler, starting with ON period



DPDT-version
Can be connected as shown in ex. 1 - 2 - 3 and 4



MODE OF OPERATION

Example 1

Delay on operate:
The delay period begins when the supply voltage is applied. At the end of the set delay, the relay will operate and not release again until the supply voltage is disconnected. After removal of the supply voltage a recovery time of 300 ms should be allowed before the system is activated again. If the supply voltage is removed for more than 300 ms before the relay operates the time circuit resets to zero, and the S-system is ready for a new timing period.

Example 2

Interval timer:
The relay operates and the time cycle starts, when supply voltage is applied to the S-system. At the end of the set delay the relay releases, and will not operate again, until the supply voltage is reapplied. A recovery time of 300 ms should be allowed before the system is activated again. If the supply voltage is removed for more than 300 ms before the time has expired, the relay releases and the time is reset to zero.

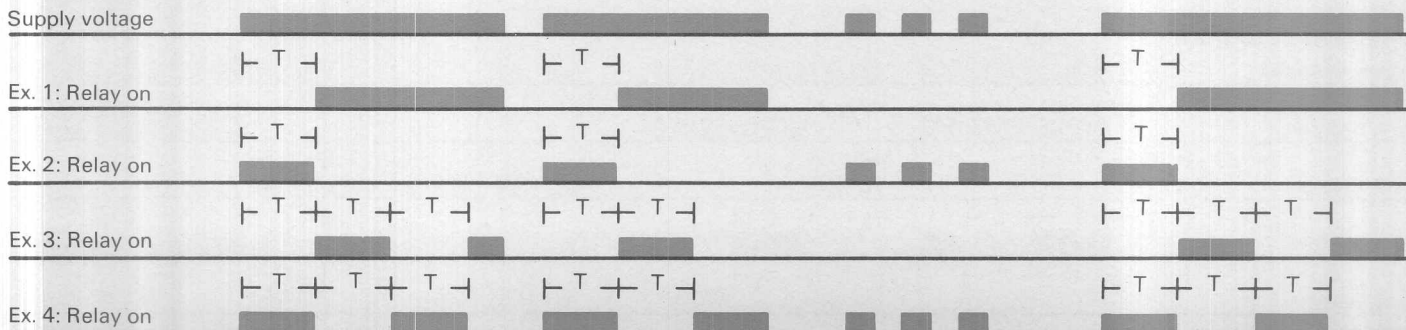
Example 3

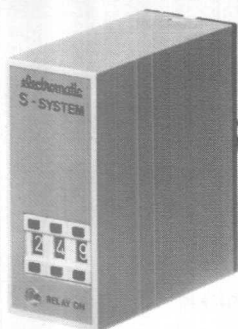
Recycler, starting with OFF period:
By connecting the supply voltage the time circuit starts. When the set time expires the relay operates. After expiry of a corresponding period the relay releases. This sequence is continued with EQUAL intervals until the supply voltage is disconnected. If the supply voltage is disconnected the time is reset to zero and a recovery time of 300 ms should be allowed before the system is ready for a new activation.

Example 4

Recycler, starting with ON period:
By connecting the supply voltage the relay operates, and when the set time expires the relay releases. After expiry of a corresponding period the relay operates again. This sequence is continued with EQUAL time intervals until the supply voltage is disconnected. If the supply voltage is disconnected the time is reset to zero and a recovery time of 300 ms should be allowed before the system is ready for a new activation.

OPERATION DIAGRAM





SABC 149/249
Digital setting

SABC 149/249

- * Programmable time relay to 999 seconds.
- * Automatic start.
- * Applicable for delay on operate, interval timing and symmetrical recycling.
- * Digital setting, 3 digits.
- * Quartz-controlled digital timing circuit.
- * Repeatability: $\pm 0.005\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.1– 99.9 s
1 –999 s.

Setting accuracy

100%.

Repeatability

$\pm 0.005\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 0.01\%$.

Reset of time and/or relay

Disconnection of supply voltage for min. 100 ms.

Programming of SABC 149/249

Delay on operate:
Connection between pins 6 and 7.

Interval timer:
No connections between pins 5-6 and 7.

Recycler, starting with OFF period:
Connection between pins 5 - 6 and 7.

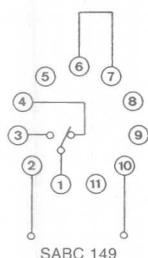
Recycler, starting with ON period:
Connection between pins 5 and 6.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

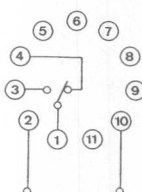
WIRING DIAGRAMS

Example 1
Delay on operate



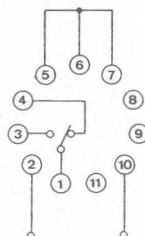
SABC 149

Example 2
Interval timer



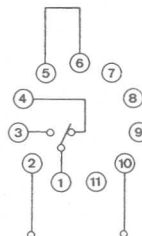
SABC 149

Example 3
Recycler, starting with OFF period



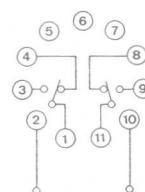
SABC 149

Example 4
Recycler, starting with ON period



SABC 149

DPDT-version
Can be connected
as shown in
Ex. 1 - 2 - 3 and 4



SABC 249

MODE OF OPERATION

Example 1:

Delay on operate: The delay period begins when the supply voltage is applied. At the end of the set delay, the relay will operate and not release again until the supply voltage is interrupted. After removal of the supply voltage a recovery time of 100 ms should be allowed before the system is activated again. If the supply voltage is removed for more than 100 ms before the relay operates the time circuit resets to zero, and the S-system is ready for a new timing period.

Example 2:

Interval timer: The relay operates and the time cycle starts, when supply voltage is applied to the S-system. At the end of the set delay the relay releases, and will not operate again, until the supply voltage is reapplied. A recovery time of 100 ms should be allowed before the system is activated again. If the supply voltage is removed for more than 100 ms before the time has expired, the relay releases and the time is reset to zero.

Example 3:

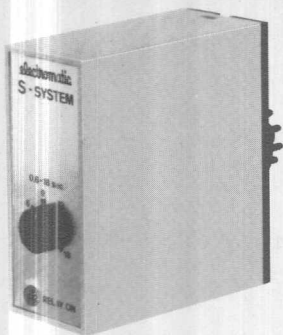
Recycler, starting with OFF period: By connecting the supply voltage the time circuit starts. When the set time expires the relay operates. After expiry of a corresponding period the relay releases. This sequence is continued with EQUAL intervals until the supply voltage is disconnected. If the supply voltage is interrupted the time is reset to zero and a recovery time of 100 ms should be allowed before the system is ready for a new activation.

Example 4:

Recycler, starting with ON period: By connecting supply voltage the relay operates, and when the set time expires the relay releases. After expiry of a corresponding period the relay operates again. This sequence is continued with EQUAL time intervals until the supply voltage is disconnected. If the supply voltage is interrupted the time is reset to zero and a recovery time of 100 ms should be allowed before the system is ready for a new activation.

OPERATION DIAGRAM





SAM 205
Knob-adjustable

SAM 205

- * Delay on operate to 600 secs.
- * Automatic start.
- * Knob-adjustable.
- * 2 contacts: One instantaneous, one delayed.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 2 output relays, both 10 A SPDT.
- * LED-indication for delayed relay on.
- * AC- or DC supply voltage.

S
A

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15- 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
30 - 600 s.

Range accuracy

+ 5% on max.
- 10% on min.

Repeatability

$\pm 1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 2\%$.

Reset of time and/or relay

Occurs by disconnecting the supply voltage for min. 300 ms.

Time adjustment

SAM 205

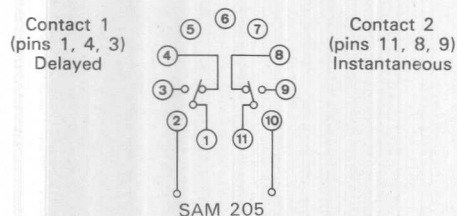
Knob-adjustable with scale in seconds.

Scale accuracy: $\pm 10\%$.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAM



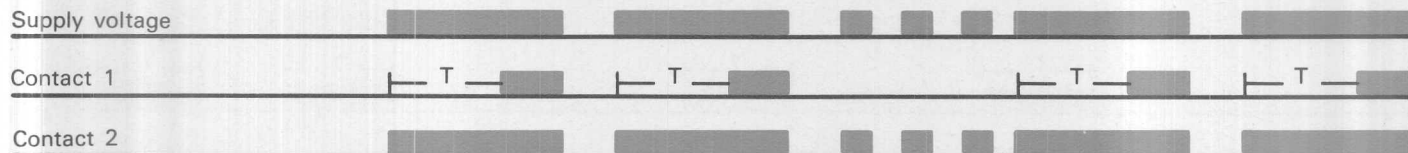
MODE OF OPERATION

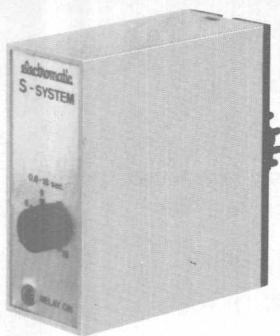
Contact 2 operates instantaneously when the supply voltage is applied. After expiration of the set delay, contact 1 operates.

Both contacts remain in operating position until the supply voltage is disconnected. After 300 ms the S-system is ready for a new operation.

By removal of the supply voltage during a timing period, contact 1 remains in its resting position, and contact 2 returns immediately to resting position. After 300 ms the S-system is ready for a new operation.

OPERATION DIAGRAM





SB 105/205
Knob-adjustable

SB 105/205

- * Interval timer to 600 secs.
- * Automatic start.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10–12.

Time ranges

0.15– 3 s
0.8 – 18 s
3 – 60 s
8 – 180 s
30 – 600 s.

Range accuracy

+ 5% on max.
– 10% on min.

Repeatability

$\pm 1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 2\%$.

Reset of time and relay

Disconnection of supply voltage for min. 300 ms.

Time adjustment

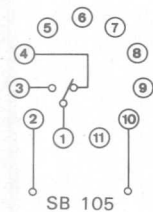
SB 105/205

Knob-adjustable with scale in seconds.
Scale accuracy: $\pm 10\%$.

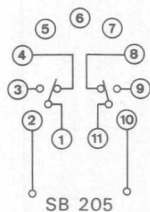
Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



SB 105



SB 205

MODE OF OPERATION

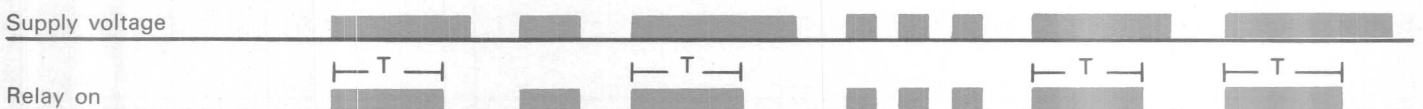
The relay operates and the time cycle starts, when supply voltage is applied to the S-system.

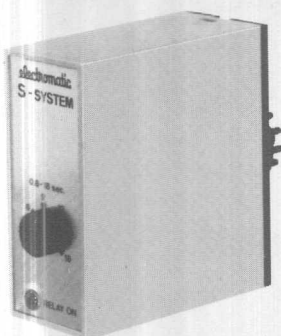
At the end of the set delay the relay releases, and will not operate again, until the supply voltage is reapplied.

A recovery time of 300 ms should be allowed before the system is activated again.

If the supply voltage is removed for more than 300 ms before the time has expired the relay releases and the time is zero-set.

OPERATION DIAGRAM





SB 115/215
Knob-adjustable

SB 115/215

- * Interval timer to 600 secs.
- * Automatic start. Restart by metallic contact or proximity sensor with built-in NPN output transistor with open collector.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

S
B

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15- 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
30 - 600 s.

Range accuracy

+ 5 % on max.
- 10 % on min.

Repeatability

$\pm 1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 2\%$.

Restart of relay and reset of time

Occurs by interconnecting pins 5 and 7 for min. 10 ms, either by a metallic contact or by a proximity sensor with built-in amplifier.

Reset of time and relay

Occurs by removal of the supply voltage for min. 300 ms.

Time adjustment SB 115/215

Knob-adjustable with scale in seconds.
Scale accuracy: $\pm 10\%$.

Power output

Pin 6: + 24 VDC.
Use proximity sensor with built-in NPN output transistor with open collector.
Connect (+) to pin 6, (-) to pin 7, and (out) to pin 5.

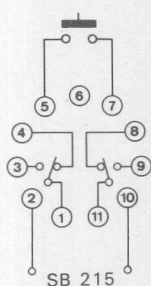
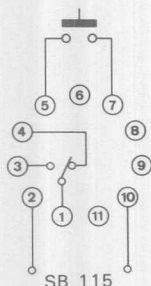
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

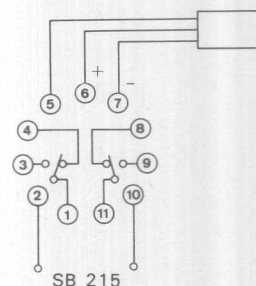
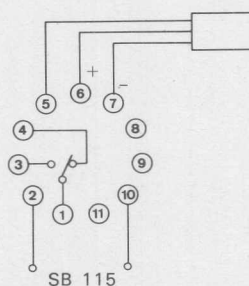
Inductive, capacitive or optical proximity sensors with built-in NPN output transistor with open collector.
See catalogue on accessories.

WIRING DIAGRAMS

Example 1
With metallic contact



Example 2
Proximity sensor with amplifier



MODE OF OPERATION

Example 1

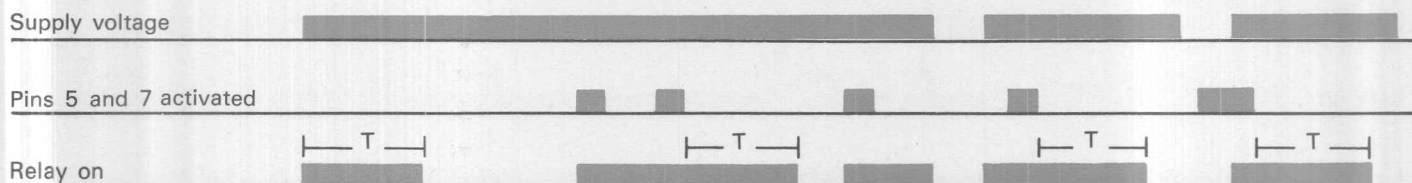
The relay operates when the supply voltage is connected. When the set time has expired the relay releases. If pins 5 and 7 are interconnected before the time has expired, a new full time period starts at the rear edge of the pulse. If the relay has released and pins 5 and 7 are interconnected the relay will immediately operate. A new delay period starts when pins 5 and 7 are disconnected.

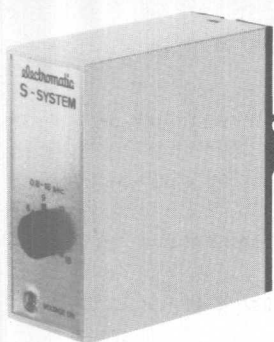
Disconnection of the supply voltage before the set time has expired causes the relay to release immediately, and the time to reset.
After 300 ms the S-system is ready for a new activation.

Example 2

The same mode of operation as described in example 1.
Here, however, interconnection of pins 5 and 7 is executed, not with a metallic contact but with an inductive, capacitive or optical proximity sensor with built-in amplifier, powered from pin 6 on the relay (+ 24 VDC).

OPERATION DIAGRAM





SB 125
Knob-adjustable

SB 125

- * Delay on release up to 180 secs. after supply voltage drops out.
- * Knob-adjustable.
- * Repeatability: $\pm 5\%$.
- * 5 A SPDT output relay.
- * LED-indication of connected supply voltage.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Time ranges

0.15- 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s.

Range accuracy

+ 20 % on max.
- 10 % on min.

Repeatability
 $\pm 5\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 10\%$.

Reset of relay and/or time

Occurs automatically by reapplying supply voltage for min. 100 ms.

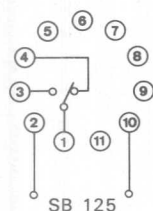
Time adjustment

Knob-adjustable with scale in seconds.
Scale accuracy: $\pm 20\%$.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAM



MODE OF OPERATION

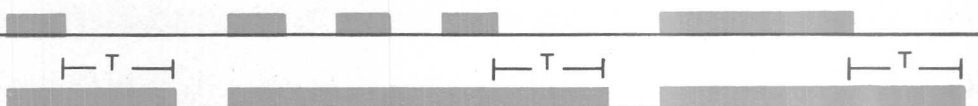
By applying supply voltage the relay operates.
When supply voltage is disconnected the time circuit starts and at the end of the set time the relay releases.
If the supply voltage is reapplied before the relay releases, the time is reset and the relay remains on.

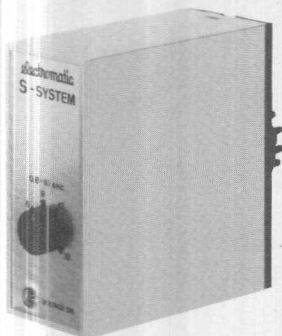
Please note. The SB 125 should not be operated by short pulses. For this purpose, the relays SB 185/285, which operate by an external contact function, should be used.

OPERATION DIAGRAM

Supply voltage

Relay on





SB 135
Knob-adjustable

SB 135

- * Delay on release up to 180 hours after supply voltage drops out.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 5 A SPDT output relay.
- * LED-indication of connected supply voltage.
- * AC- or DC supply voltage.

S
B

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
0.5 - 10 m
3 - 60 m
8 - 180 m
0.5 - 10 h
3 - 60 h
8 - 180 h.

Range accuracy
+ 5 % on max.
- 10 % on min.

Repeatability
 $\pm 0.1\%$.

Max. time variation
Within the limits of rated supply voltage and ambient temperature:
 $\pm 1\%$.

Reset of relay and/or time
Occurs automatically by reapplying supply voltage for min. 100 ms.

Time adjustment SB 135

Knob-adjustable with scale in seconds, minutes or hours.
Scale accuracy: $\pm 10\%$.

Built-in battery data

Nominal voltage: 5 V
Capacity: 40 mAh
Charging current: 360 μ A
Discharging current: 120 μ A.

Battery control

Between pins 6 and 7.
Pin 6 positive.
 $R_1 = 1\text{ k}\Omega$.

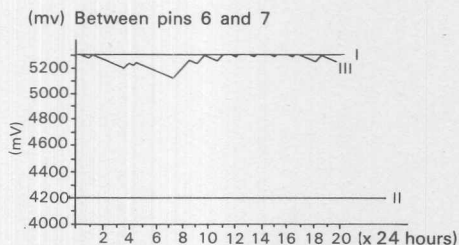
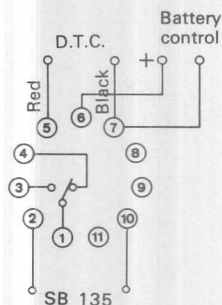
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Digital Timer Control

Connection for Digital Timer Control (D.T.C.) between pins 5 and 7.
Pin 5 positive.
See catalogue on accessories.

WIRING DIAGRAM



CURVE I:

Ideal battery voltage at disconnected supply voltage.

CURVE II:

Minimum battery-voltage. In order to achieve correct time-measuring and maximum battery-duration, recharge of battery should be carried out, before voltage drops to minimum level.

CURVE III:

Course of battery-voltage, where the relay, as in many practical applications, is operated with changing duration of both discharging and recharging periods, but where the duration of the recharging periods always equals at least one third of the total of discharging periods.

MODE OF OPERATION

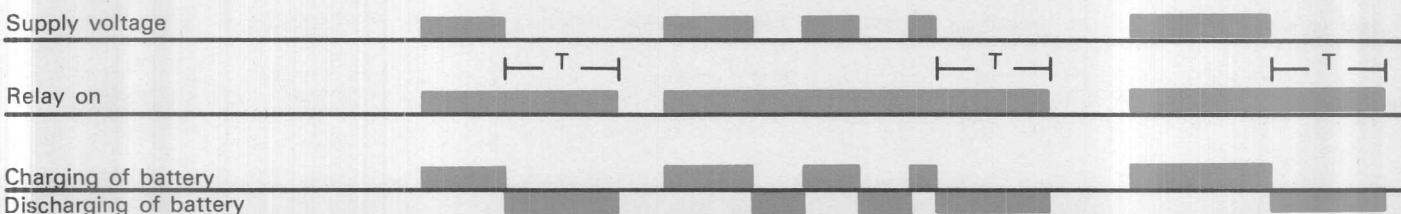
The relay operates immediately when the supply voltage is applied. When the supply voltage is disconnected, the time cycle starts and by expiration of the set time, the relay releases. If the supply voltage is reapplied, before the relay is released, the time is reset and the relay remains on. The built-in battery is recharged, as long as the supply voltage is applied, and is discharged during periods of time measuring.

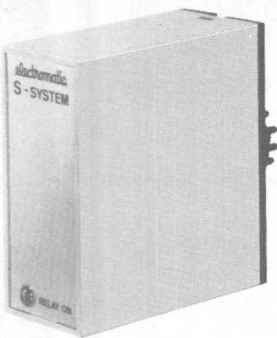
To maintain a sufficient amount of energy in the battery, it is necessary that the S-system over a longer period of time is recharged for at least one third of the sum of the discharging periods, as the recharge/discharge-current ratio is 3:1. The capacity of the built-in battery is enough for more than 400 hours of continuous time-measuring without recharging the battery. SB 135 is designed to survey the presence of an external supply voltage and to signal, after a pre-set time delay, the absence of that external supply voltage.

Please note. The SB 135 should not be operated by short pulses. For this purpose, the relay SB 165, which operates by an external contact function should be used.

NB! It is recommended to connect SB 135 to the supply voltage for 48 hours before it is put into regular service in order to compensate for energy losses caused by a possibly very long stocking period.

OPERATION DIAGRAM





SB 140/240
External resistor
adjustable

SB 140/240

- * Interval timer to 180 hours.
- * Automatic start.
- * External resistor adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

**Common technical data
and ordering key**
Pages 10–12.

Time ranges

0.15– 3 s
3 – 60 s
0.8 – 18 s
3 – 60 m
8 –180 s
0.5 – 10 m
3 – 60 m
8 –180 m
0.5 – 10 h
3 – 60 h
8 –180 h.

Range accuracy
 $+ 5\%$ on max.
 $- 10\%$ on min.

Repeatability
 $\pm 0.1\%$.

Max. time variation
Within the limits of rated
supply voltage and ambient
temperature:
 $\pm 1\%$.

**Reset of time
and/or relay**
Disconnection of supply vol-
tage for min. 100 ms.

Time adjustment SB 140/240

External resistor or linear re-
mote potentiometer R_T .
0–1 M Ω , 0.25 W.
The external resistor must be
connected before the S-sy-
stem will operate.

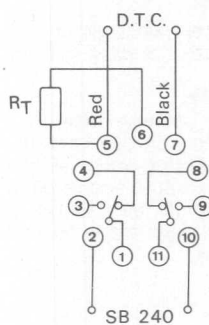
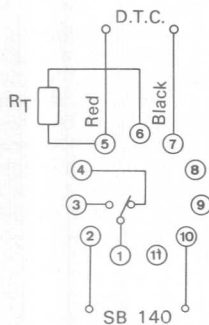
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.
Remote potentiometer kit.

Digital Timer Control

Connection for Digital Timer
Control (D.T.C.) between pins
5 and 7.
Pin 5 positive.
See catalogue on accessories.

WIRING DIAGRAMS

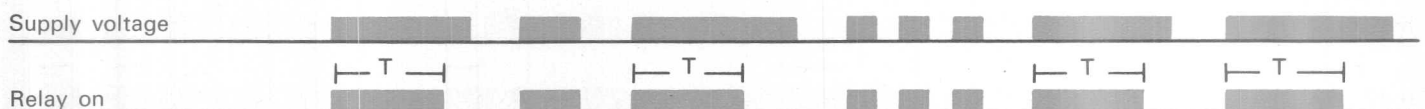


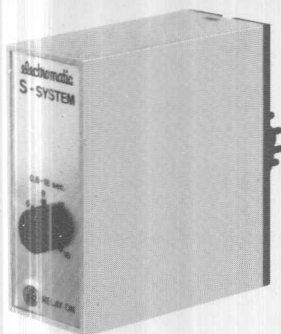
MODE OF OPERATION

The relay operates and the time cycle
starts, when supply voltage is applied to
the S-system.
At the end of the set delay, the relay re-
leases, and will not operate again, until
the supply voltage is reapplied.

A recovery time of 100 ms should be al-
lowed before the S-system is activated
again.
If the supply voltage is removed for
more than 100 ms before the time has
expired the relay releases and the time is
reset to zero.

OPERATION DIAGRAM





SB 145/245
Knob-adjustable

SB 145/245

- * Interval timer to 180 hours.
- * Automatic start.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

S
B

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
0.5 - 10 m
3 - 60 m
8 - 180 m
0.5 - 10 h
3 - 60 h
8 - 180 h.

Range accuracy

+ 5 % on max.
- 10 % on min.

Repeatability

$\pm 0.1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 1\%$.

Reset of time and/or relay

Disconnection of supply voltage for min. 100 ms.

Time adjustment

SB 145/245

Knob-adjustable with scale in seconds, minutes or hours.
Scale accuracy: $\pm 10\%$.

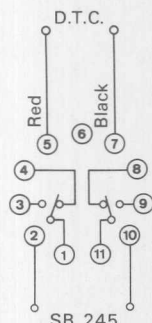
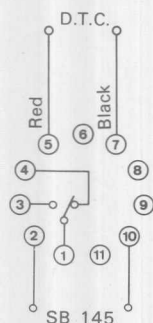
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Digital Timer Control

Connection for Digital Timer Control (D.T.C.) between pins 5 and 7.
Pin 5 positive.
See catalogue on accessories.

WIRING DIAGRAMS



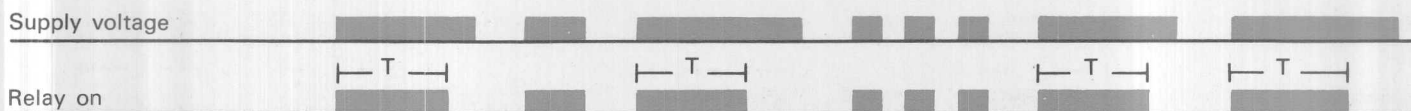
MODE OF OPERATION

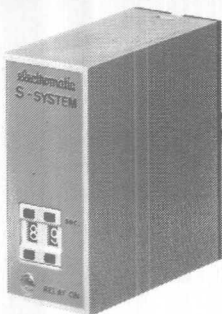
The relay operates and the time cycle starts, when supply voltage is applied to the S-system. At the end of the set delay, the relay releases, and will not operate again, until the supply voltage is reapplied.

A recovery time of 100 ms should be allowed before the S-system is activated again.

If the supply voltage is removed for more than 100 ms before the time has expired the relay releases and the time is reset to zero.

OPERATION DIAGRAM





SB 149/249
Digital switch
adjustable

SB 149/249

- * Interval timer to 99 hours.
- * Automatic start.
- * Digital switch-adjustable.
- * Quartz-controlled digital timing circuit.
- * Repeatability: $\pm 0.005\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

**Common technical data
and ordering key**
Pages 10-12.

Time ranges

0.1- 9.9 s
1 -99 s
0.1- 9.9 m
1 -99 m
0.1- 9.9 h
1 -99 h.

Setting accuracy
100 %.

Repeatability
 $\pm 0.005\%$.

Max. time variation

Within the limits of rated
supply voltage and ambient
temperature:
 $\pm 0.01\%$.

Reset of time and/or relay

Disconnection of supply vol-
tage for min. 100 ms.

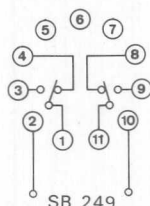
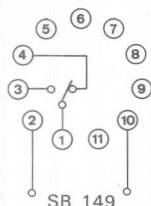
Time adjustment
SB 149/249

2 digit built-in time selector.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



MODE OF OPERATION

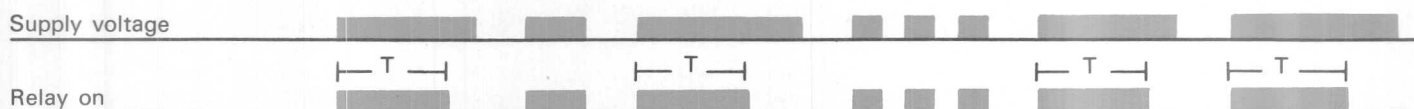
The relay operates and the time cycle
starts, when supply voltage is applied to
the S-system.

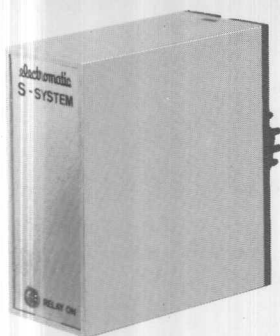
At the end of the set delay, the relay re-
leases, and will not operate again, until
the supply voltage is reapplied.

A recovery time of 100 ms should be al-
lowed before the system is activated
again.

If the supply voltage is removed for
more than 100 ms before the time has
expired the relay releases and the time is
reset to zero.

OPERATION DIAGRAM





SB 150
External resistor
adjustable

SB 150

- * Interval timer to 180 hours.
- * Automatic start. Restart by contact.
- * External resistor adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

S
B

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15- 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
0.5 - 10 m
3 - 60 m
8 - 180 m
0.5 - 10 h
3 - 60 h
8 - 180 h.

Range accuracy

+ 5% on max.
- 10% on min.

Repeatability

$\pm 0.1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 1\%$.

Restart of relay and reset of time

Occurs by interconnecting pins 5 and 7.
24 VDC - 5 mA.
Pin 5 positive.
Pulse duration: Min. 10 ms.

Reset of time and/or relay

Disconnection of supply voltage for min. 300 ms.

Time adjustment SB 150

External resistor or linear remote potentiometer R_T .
0-1 M Ω , 0.25 W.
The external resistor must be connected before the S-system will operate.

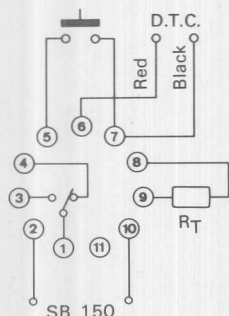
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.
Remote potentiometer kit.

Digital Timer Control

Connection for Digital Timer Control (D.T.C.) between pins 6 and 7.
Pin 6 positive.
See catalogue on accessories.

WIRING DIAGRAM



MODE OF OPERATION

When the supply voltage is connected the relay operates immediately. When the set time has expired, the relay releases.

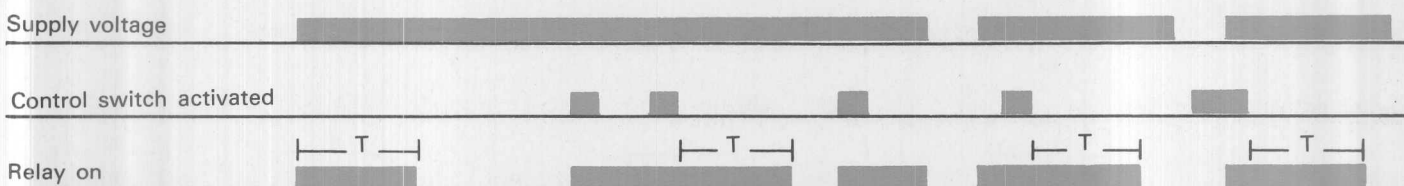
When pins 5 and 7 are connected before the time has expired, a new full time period starts when pins 5 and 7 are disconnected again.

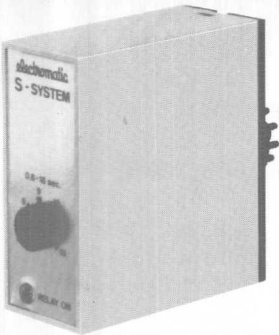
When pins 5 and 7 are connected after the time has expired, the relay operates immediately.

A new time period will start when pins 5 and 7 are disconnected.

Disconnection of the supply voltage before the set time has expired causes the relay to release immediately, and the time to be zero-set. After 300 ms the S-system is ready for a new activation.

OPERATION DIAGRAM





SB 155/255
Knob-adjustable

SB 155/255

- * Interval timer to 180 hours.
- * Automatic start. Restart with contact.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10–12.

Time ranges

0.15– 3 s
0.8 – 18 s
3 – 60 s
8 – 180 s
0.5 – 10 m
3 – 60 m
8 – 180 m
0.5 – 10 h
3 – 60 h
8 – 180 h.

Range accuracy
+ 5% on max.
– 10% on min.

Repeatability
 $\pm 0.1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 1\%$.

Restart of relay and reset of time

Occurs by interconnecting pins 5 and 7.
24 VDC – 5 mA.
Pin 5 positive.
Pulse duration: Min. 10 ms.

Reset of time and/or relay

Occurs by disconnecting supply voltage for min. 300 ms.

Time adjustment SB 155/255

Knob-adjustable with scale in seconds, minutes or hours.
Scale accuracy: $\pm 10\%$.

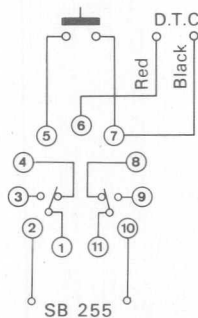
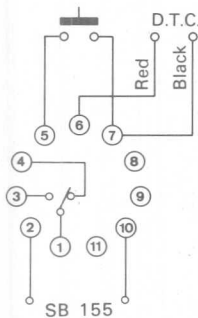
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Digital Timer Control

Connection for Digital Timer Control (D.T.C.) between pins 6 and 7.
Pin 6 positive.
See catalogue on accessories.

WIRING DIAGRAMS

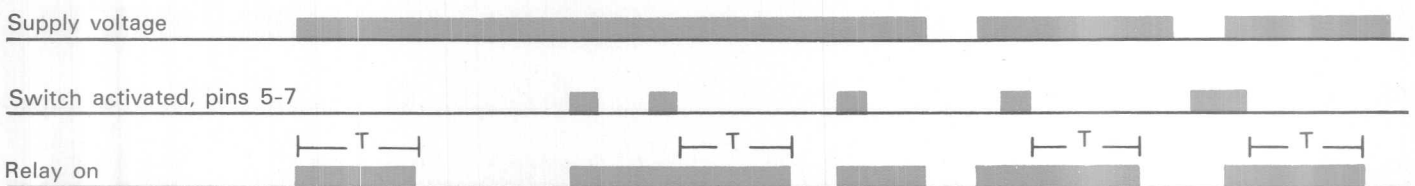


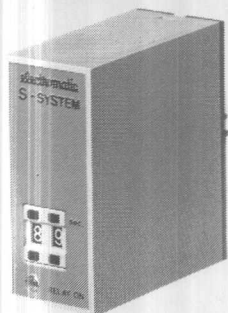
MODE OF OPERATION

When the supply voltage is applied the relay will operate. When the set time expires the relay releases.
If pins 5 and 7 are interconnected before the set time has expired the time is reset to zero, and a new delay period begins when pins 5 and 7 are disconnected. If the relay has released and pins 5 and 7 are interconnected the relay will immediately operate. A new delay period starts when pins 5 and 7 are disconnected.

The relay will release and the time be reset to zero if the supply voltage is disconnected before the set time has expired.
After 300 ms the S-system is ready for a new activation.

OPERATION DIAGRAM





SB 159/259
Digital switch
adjustable

SB 159/259

- * Interval timer to 99 hours.
- * Automatic start. Restart by contact.
- * Digital switch-adjustable.
- * Quartz-controlled digital timing circuit.
- * Repeatability: $\pm 0.005\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

S
B

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.1- 9.9 s
1 -99 s
0.1- 9.9 m
1 -99 m
0.1- 9.9 h
1 -99 h.

Setting accuracy

100 %.

Repeatability

$\pm 0.005\%$.

Max. time variation

Within the limits of rated
supply voltage and ambient
temperature:
 $\pm 0.01\%$.

Restart of relay and reset of time

Occurs by interconnecting
pins 5 and 7.
24 VDC - 5 mA.
Pin 5 positive.
Pulse duration: Min. 10 ms.

Reset of time and/or relay

Occurs by disconnecting
the supply voltage for
min. 200 ms.

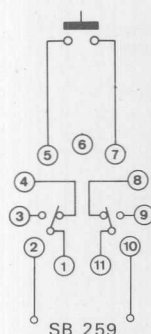
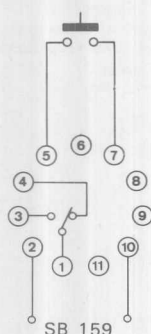
Time adjustment SB 159/259

2 digit built-in time selector.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



MODE OF OPERATION

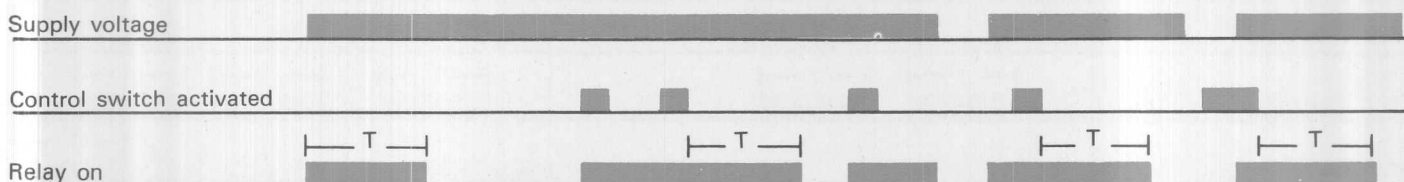
When the supply voltage is connected the relay operates immediately. When the set time has expired, the relay releases. If pins 5 and 7 are connected before the time has expired, a new full time period starts when pins 5 and 7 are disconnected again.

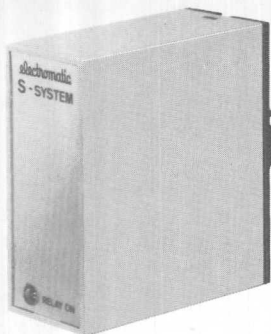
When pins 5 and 7 are connected after the time has expired, the relay operates immediately.

A new time period will start when pins 5 and 7 are disconnected.

Disconnection of the supply voltage before the set time has expired causes the relay to release immediately, and the time to be zero-set. After 200 ms the S-system is ready for a new activation.

OPERATION DIAGRAM





SB 160
External resistor
adjustable

SB 160

- * Interval timer to 180 hours.
- * Start and reset of time and/or relay with contact.
- * External resistor adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
0.5 - 10 m
3 - 60 m
8 - 180 m
0.5 - 10 h
3 - 60 h
8 - 180 h.

Range accuracy

+ 5% on max.
- 10% on min.

Repeatability

$\pm 0.1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 1\%$.

Start of time and relay

Occurs by interconnecting pins 5 and 7.
24 VDC - 10 mA.
Pin 5 positive.
Pulse duration: Min 10 ms.

Reset of time

Occurs by interconnecting pins 6 and 7.
24 VDC - 10 mA.
Pin 6 positive.
Pulse duration: Min. 10 ms.

Time adjustment

SB 160

External resistor or linear remote potentiometer R_T .
0-1 M Ω , 0.25 W.
The external resistor must be connected before the S-system will operate.

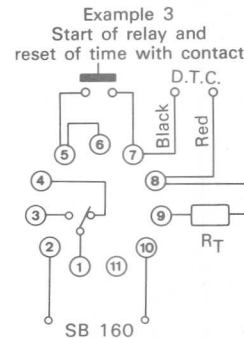
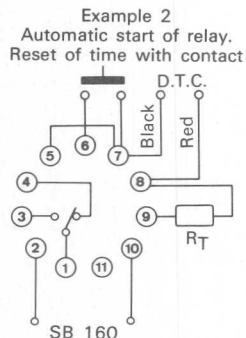
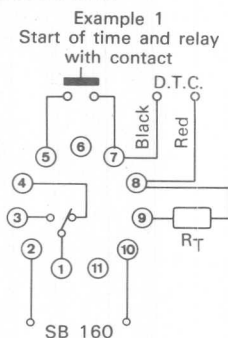
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.
Remote potentiometer kit.

Digital Timer Control

Connection for Digital Timer Control (D.T.C.) between pins 7 and 8.
Pin 8 positive.
See catalogue on accessories.

WIRING DIAGRAMS



MODE OF OPERATION

Example 1

The supply voltage must be constantly applied.
When pins 5 and 7 are interconnected, the relay will operate and the timing period start. When the set period has elapsed the relay will release whether pins 5 and 7 are still interconnected or not.

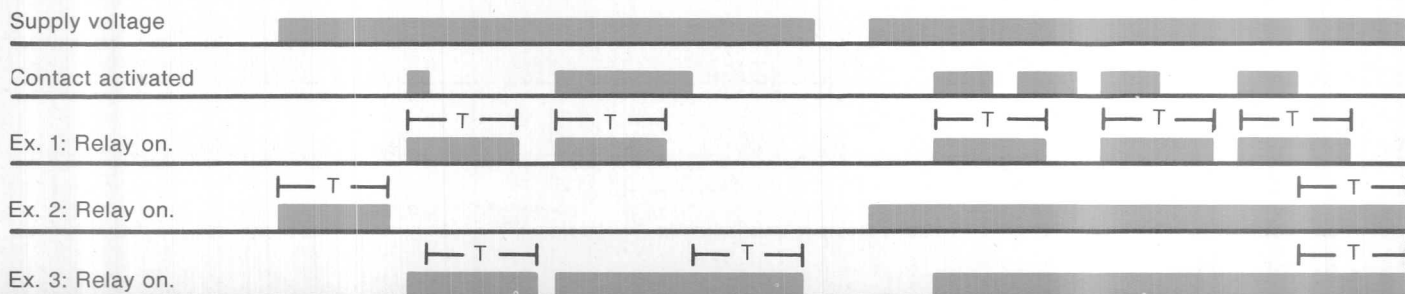
Example 2

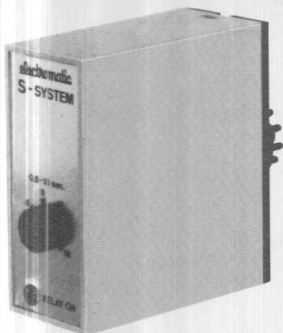
When the supply voltage is connected the relay will operate and the timing period start. When the period has elapsed the relay will release.
The sequence can be repeated by disconnecting the supply voltage for min. 100 ms.
By interconnecting pins 6 and 7 before the set time has expired, the time is reset to zero, and the timing period re-starts when pins 6 and 7 are disconnected.
Do not forget constant interconnection of pins 5 and 7.

Example 3

The supply voltage must be constantly connected.
By interconnecting pins 5 and 7 (pins 5 and 6 must be constantly interconnected) the relay will operate.
When pins 5 and 7 are disconnected the timing period starts, and when the period has elapsed the relay will release. If pins 5 and 7 are interconnected before the delay period has expired the time is zero-set, and a new full timing period starts when the interconnection between pins 5 and 7 is interrupted.

OPERATION DIAGRAM





SB 165
Knob-adjustable

SB 165

- * Interval timer to 180 hours.
- * Start and reset of time and/or relay with contact.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

S
B

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 m
8 - 180 s
0.5 - 10 m
3 - 60 m
8 - 180 m
0.5 - 10 h
3 - 60 h
8 - 180 h.

Range accuracy

+ 5% on max.
- 10% on min.

Repeatability

$\pm 0.1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 1\%$.

Start of time and relay

Occurs by interconnecting pins 5 and 7.
24 VDC - 10 mA.
Pin 5 positive.
Pulse duration: Min. 10 ms.

Reset of time

Occurs by interconnecting pins 6 and 7.
24 VDC - 10 mA.
Pin 6 positive.
Pulse duration: Min. 10 ms.

Time adjustment

SB 165
Knob-adjustable with scale in seconds, minutes or hours.
Scale accuracy: $\pm 10\%$.

Accessories

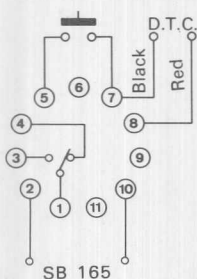
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Digital Timer Control

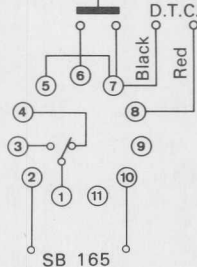
Connection for Digital Timer Control (D.T.C.) between pins 7 and 8.
Pin 8 positive.
See catalogue on accessories.

WIRING DIAGRAMS

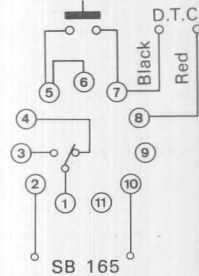
Example 1
Start of time and relay with contact



Example 2
Automatic start of relay.
Reset of time with contact



Example 3
Start of relay and reset of time with contact



MODE OF OPERATION

Example 1

The supply voltage must be constantly applied.
When pins 5 and 7 are interconnected, the relay will operate and the timing period starts. When the set period has elapsed the relay will release whether pins 5 and 7 are still interconnected or not.

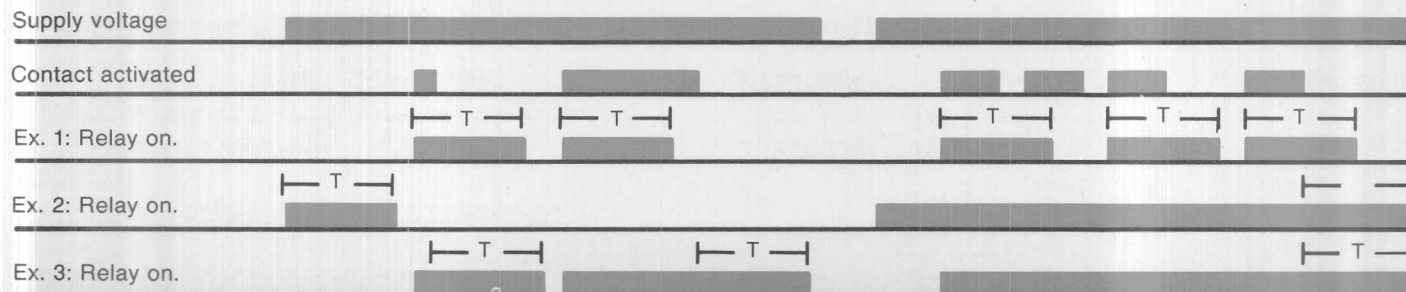
Example 2

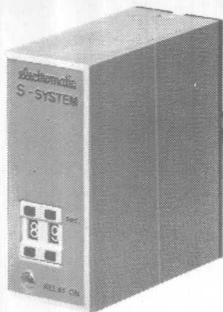
When the supply voltage is connected the relay will operate and the timing period starts. When the period has elapsed the relay will release.
The sequence can be repeated by disconnecting the supply voltage for min. 100 ms.
By interconnecting pins 6 and 7 before the set time has expired, the time is reset to zero, and the timing period restarts when the interconnection between pins 6 and 7 is disconnected.
Do not forget constant interconnection of pins 5 and 7.

Example 3

The supply voltage must be constantly connected.
By interconnecting pins 5 and 7 (pins 5 and 6 must be constantly interconnected) the relay will operate. When pins 5 and 7 are disconnected the timing period starts, and when the period has elapsed the relay will release.
If pins 5 and 7 are interconnected before the delay period has expired the time is zero-set, and a new full timing period starts when the interconnection between pins 5 and 7 is interrupted.

OPERATION DIAGRAM





SB 169/269
Digital switch
adjustable

SB 169/269

- * Interval timer to 99 hours.
- * Start and reset of time and/or relay by contact.
- * Digital switch-adjustable.
- * Quartz-controlled digital timing circuit.
- * Repeatability: $\pm 0.005\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.1- 9.9 s
1 -99 s
0.1- 9.9 m
1 -99 m
0.1- 9.9 h
1 -99 h.

Setting accuracy

100 %.

Repeatability

$\pm 0.005\%$.

Max. time variation

Within the limits of rated
supply voltage and ambient
temperature:
 $\pm 0.01\%$.

Start of time and relay

Occurs by interconnecting
pins 5 and 7.
24 VDC - 10 mA.
Pin 5 positive.
Pulse duration: Min. 10 ms.

Reset of time

Occurs by interconnecting
pins 6 and 7.
24 VDC - 10 mA.
Pin 6 positive.
Pulse duration: Min. 10 ms.

Time adjustment

SB 169/269

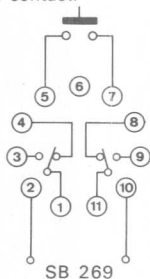
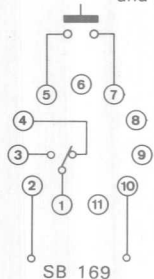
2-digit built-in time selector.

Accessories

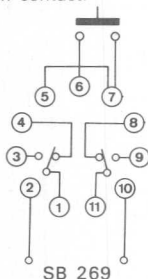
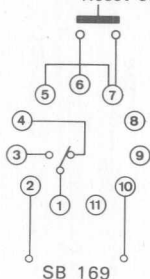
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

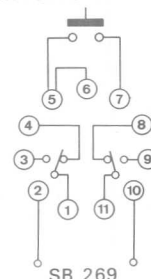
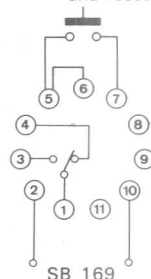
Example 1
Start of time
and relay with contact.



Example 2
Automatic start.
Reset of time with contact.



Example 3
Start of relay
and reset of time with contact.



MODE OF OPERATION

Example 1

The supply voltage must be constantly
applied.
When pins 5 and 7 are interconnected,
the relay will operate and the timing
period start. When the set period has
elapsed the relay will release whether pins
5 and 7 are still interconnected or not.

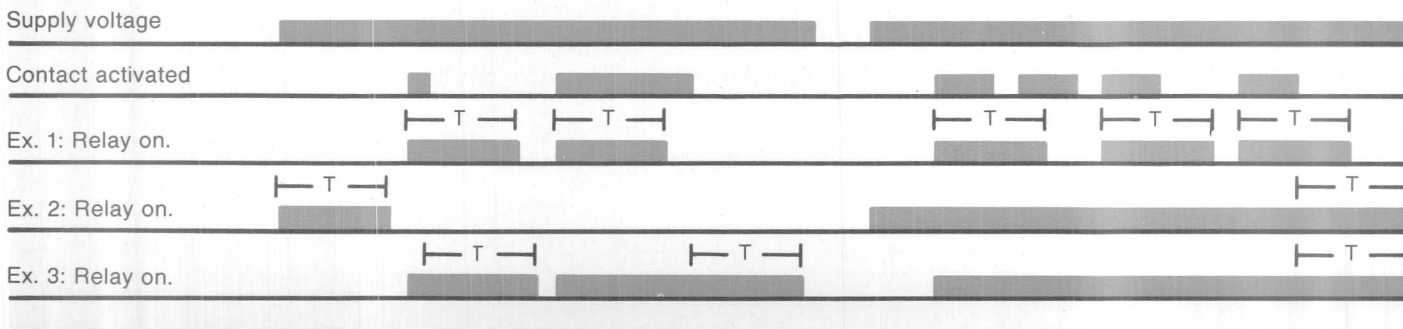
Example 2

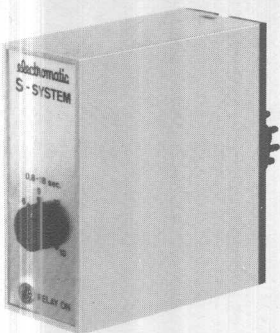
When the supply voltage is connected
the relay will operate and the timing
period start. When the period has
elapsed the relay will release.
The sequence can be repeated by
disconnecting the supply voltage for
min. 100 ms.
By interconnecting pins 6 and 7 before
the set time has expired, the time is
reset to zero, and the timing period
restarts when the interconnection
between pins 6 and 7 is disconnected.
Do not forget constant interconnection
of pins 5 and 7.

Example 3

The supply voltage must be constantly
connected.
By interconnecting pins 5 and 7 (pins 5
and 6 must be constantly intercon-
nected) the relay will operate. When pins
5 and 7 are disconnected the timing
period starts, and when the period has
elapsed the relay will release.
If pins 5 and 7 are interconnected before
the delay period has expired the time is
zero-set, and a new full timing period
starts when the interconnection be-
tween pins 5 and 7 is interrupted.

OPERATION DIAGRAM





SB 175/275
Knob-adjustable

SB 175/275

- * Interval timer to 600 secs.
- * Pulse-controlled start with metallic contact or proximity sensor with built-in NPN output transistor with open collector.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC or DC supply voltage.

S
B

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
30 - 600 s.

Range accuracy

+ 5 % on max.
- 10 % on min.

Repeatability

$\pm 1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 2\%$.

Start of time and relay

Occurs by interconnecting pins 5 and 7 for min. 10 ms, either by a metallic contact or by a proximity sensor with built-in amplifier.

Reset of time and relay

Occurs by disconnecting the supply voltage for min. 300 ms.

Time adjustment

SB 175/275

Knob-adjustable with scale in seconds.
Scale accuracy: $\pm 10\%$.

Power output

Pin 6: + 24 VDC.
Use proximity sensor with built-in NPN output transistor with open collector.
Connect (+) to pin 6, (-) to pin 7, and (out) to pin 5.

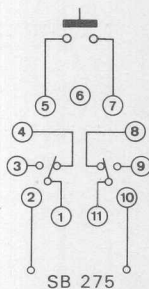
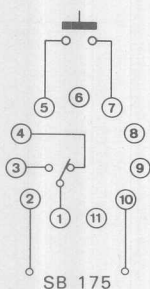
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

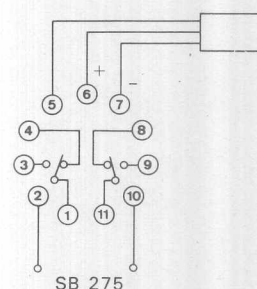
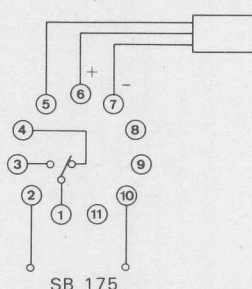
Inductive, capacitive or optical proximity sensors with built-in NPN output transistor with open collector.
See catalogue on accessories.

WIRING DIAGRAMS

Example 1
With metallic contact



Example 2
Proximity sensor with amplifier



MODE OF OPERATION

Example 1

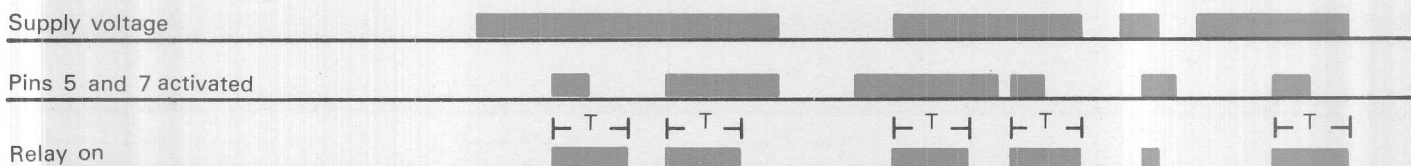
The supply voltage is applied. The relay will operate and the time circuit start when pins 5 and 7 are connected. The relay releases when the set time has expired, whether pins 5 and 7 are still connected or not.

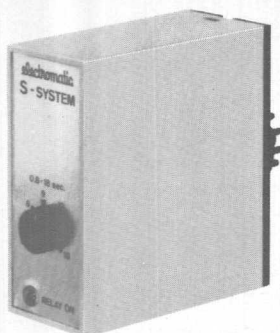
If the supply voltage is disconnected during the timing period the relay releases and the time is reset to zero. The S-system is ready for a new operation when the supply voltage has been disconnected for min. 300 ms.

Example 2

Mode of operation as described in example 1. However, in example 2, the metallic contact is replaced by an inductive, capacitive or optical proximity sensor with built-in amplifier powered from pin 6 (+ 24 VDC).

OPERATION DIAGRAM





SB 185/285
Knob-adjustable

SB 185/285

- * Interval timer to 600 secs.
- * Start and reset with metallic contact or proximity sensor with built-in NPN output transistor with open collector.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
30 - 600 s.

Range accuracy

+ 5 % on max.
- 10 % on min.

Repeatability

$\pm 1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 2\%$.

Start of relay and reset of time

Occurs by interconnecting pins 5 and 7 for min. 20 ms, either by a metallic contact or by a proximity sensor with built-in amplifier.

Reset of time and relay

Occurs by disconnection of the supply voltage for min. 500 ms.

Time adjustment

SB 185/285

Knob-adjustable with scale in seconds.
Scale accuracy: $\pm 10\%$.

Power output

Pin 6: + 24 VDC.
Use proximity sensor with built-in NPN output transistor with open collector.
Connect (+) to pin 6, (-) to pin 7, and (out) to pin 5.

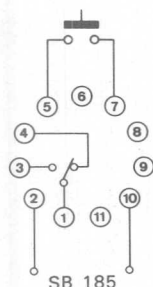
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

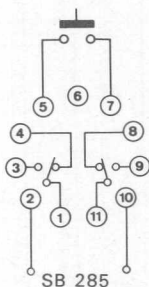
Inductive, capacitive or optical proximity sensors with built-in NPN output transistor with open collector.
See catalogue on accessories.

WIRING DIAGRAMS

Example 1
With metallic contact

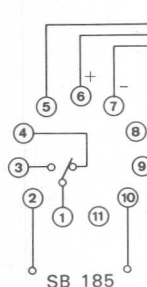


SB 185

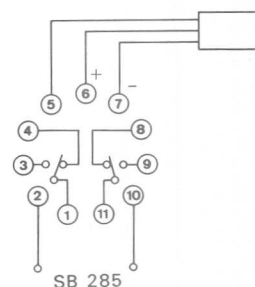


SB 285

Example 2
Proximity sensor with amplifier



SB 185



SB 285

MODE OF OPERATION

Example 1

The supply voltage is applied. The relay operates when pins 5 and 7 are interconnected for min. 20 ms. By disconnecting, the timing period starts. When the set time has expired, the relay releases.

If pins 5 and 7 are again connected before the set time has expired the time is reset to zero, and a new delay period begins when 5 and 7 are disconnected. If the relay has released and pins 5 and 7 are interconnected the relay will immediately operate. A new delay period starts when pins 5 and 7 are disconnected.

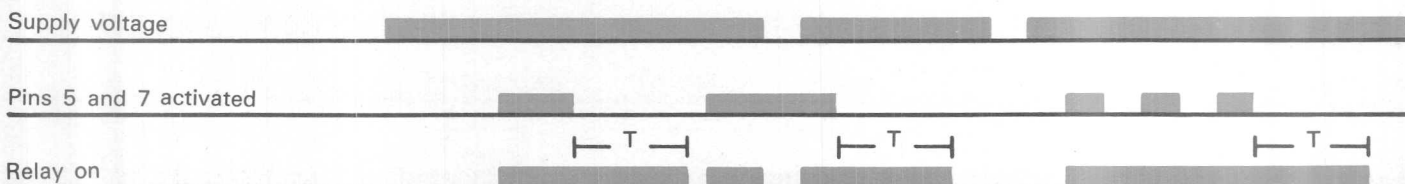
ted. The relay releases and the time is reset to zero if the supply voltage is interrupted for min. 500 ms before the set time has expired. The S-system is now ready for a new activation.

Example 2

The same mode of operation as described in example 1.

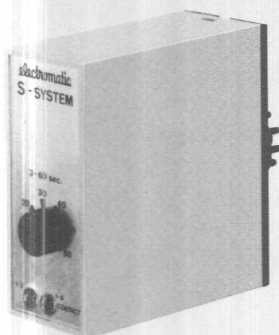
Here, however, interconnection of pins 5 and 7 is executed, not with a metallic contact but with an inductive, capacitive or optical proximity sensor with built-in amplifier, powered from pin 6 on the relay (+ 24 VDC).

OPERATION DIAGRAM



SB 195

- * Time relay for star/delta switches.
- * Automatic start.
- * Variable time of the star coupling (T_1), knob-adjustable.
- * Fixed resting period (T_2) between star/delta coupling.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT output relay with neutral centre position.
- * LED-indication for star/delta positions.
- * AC supply voltage.



SB 195
Knob-adjustable

SB

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Supply voltage

24, 120 or 220 VAC
Can to order be delivered for 380 or 415 VAC.

Time ranges (T_1)

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
30 - 600 s

Range accuracy

+ 5% on max.
- 10% on min.

Repeatability (T_1)

$\pm 1\%$.

Max. time variation (T_1)

Within the limits of rated supply voltage and ambient temperature:
 $\pm 2\%$.

Time adjustment

SB 195 (T_1)

Knob-adjustable with scale in seconds.
Scale accuracy: $\pm 10\%$.

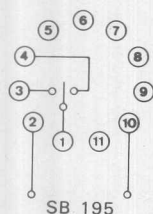
Resting period (T_2)

Typ. 100 ms fixed.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAM



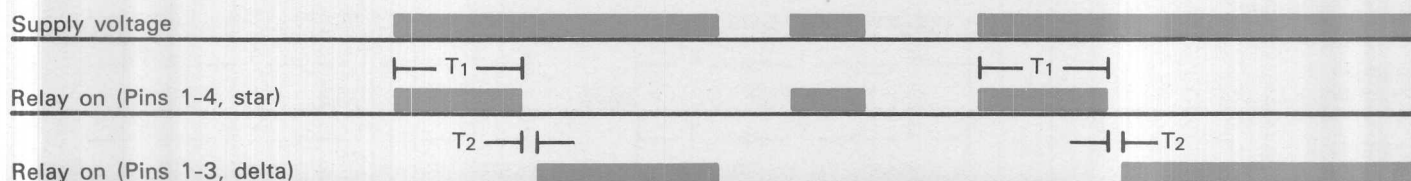
MODE OF OPERATION

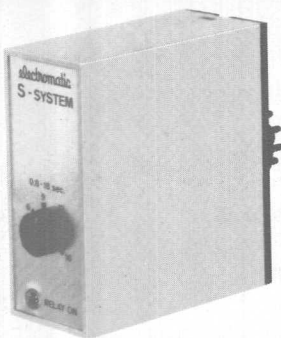
This S-system is used in conjunction with automatic star/delta switches. When supply voltage is applied to the S-system, the movable contact (pin 1) immediately changes from its neutral position to pin 4. After the set time has elapsed, the contact (pin 1) returns to neutral position where it rests for app. 100 ms and then changes to pin 3 where it remains until the supply voltage is disconnected.

The resting period (100 ms) guarantees that the contactor used for star coupling (pin 4) is with certainty switched OFF, i.e. the arc is extinguished before the contactor used for delta coupling (pin 3) is switched ON.

The S-system is ready for a new switching cycle 100 ms after removal of its supply voltage.

OPERATION DIAGRAM





SC 105/205
Knob-adjustable

SC 105/205

- * Symmetrical recycler to 600 secs.
- * Equal OFF and ON time.
- * Automatic start in OFF or ON position.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Time ranges

0.15- 3 s
0.8 - 18 s
3 - 60 s
8 -180 s
30 -600 s.

Range accuracy

+ 5 % on max.
- 10 % on min.

Repeatability
 $\pm 1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 2\%$.

Reset of time and/or relay

Occurs by disconnecting the supply voltage for min. 300 ms.

Time adjustment
SC 105/205

Knob-adjustable with scale in seconds.

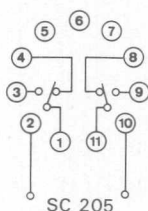
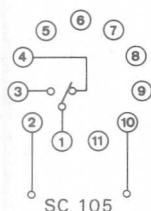
Scale accuracy: $\pm 10\%$.

Accessories

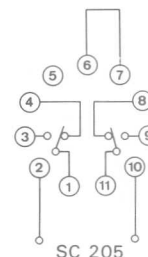
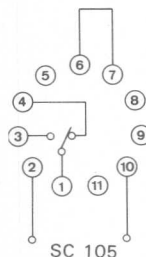
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

Example 1
OFF time first



Example 2
ON time first



MODE OF OPERATION

Example 1

OFF time first.

The supply voltage is applied, and when the set OFF time has expired the relay will operate. After an equal ON time the relay releases.

This mode of operation continues with equal OFF and ON times until the supply voltage is disconnected.

If the supply voltage is interrupted for min. 300 ms the time is reset to zero, and when the voltage is again connected, the S-system restarts in OFF position.

Example 2

ON time first.

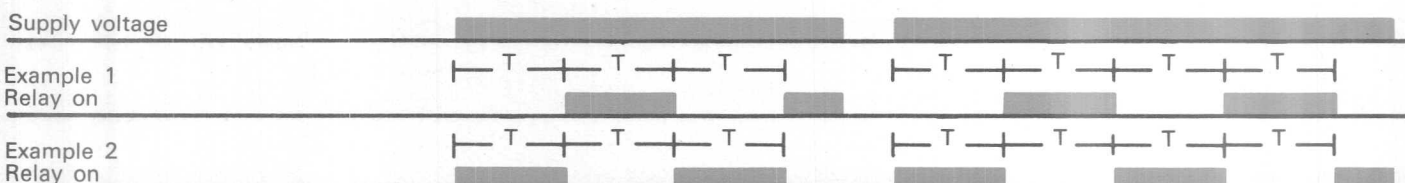
The supply voltage is applied, and because pins 6 and 7 are interconnected the relay operates immediately. When the set ON time has expired the relay releases and remains in OFF position for an interval equal to the ON time.

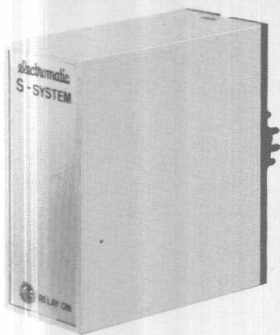
This mode of operation continues with equal ON and OFF times until the supply voltage is cut off.

If the supply voltage is interrupted for min. 300 ms the time is reset to zero, and when the voltage is again connected the S-system restarts in ON position.

Interconnect pins 6 and 7 direct on the base.

OPERATION DIAGRAM





SC 110/210
No time
adjustment

SC 110/210

- * One shot on energisation and/or de-energisation.
- * Automatic start.
- * Fixed pulse duration: 0.5 second.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication of pulse.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10–12.

Pulse duration
 $0.5 \text{ s} \pm 20 \%$.
Pulse on energisation and/or de-energisation.

Condition of function
For satisfactory operation of the system the supply voltage must be connected for min. 0.5 s.

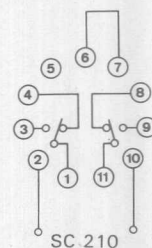
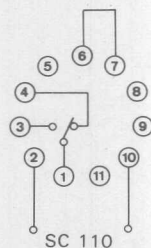
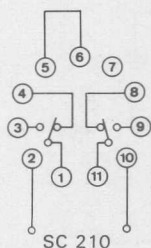
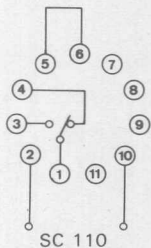
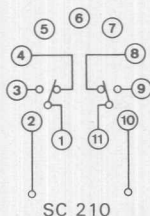
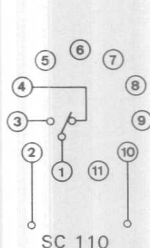
Accessories
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

Example 1

Example 2

Example 3



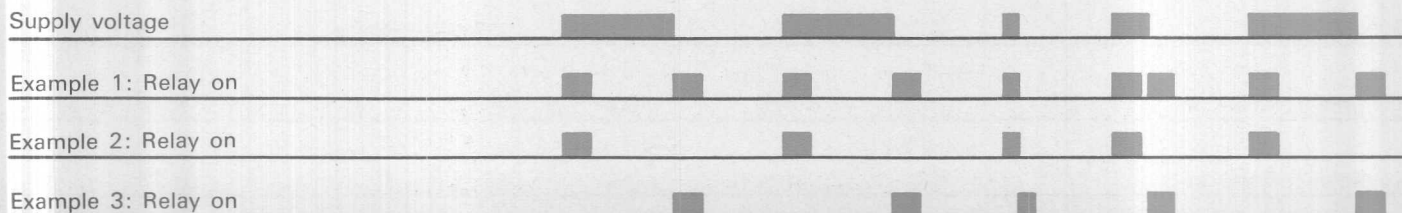
MODE OF OPERATION

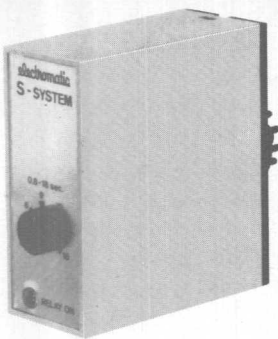
Example 1: Pulse on energisation and on de-energisation.

Example 2: Pulse only on energisation.

Example 3: Pulse only on de-energisation.

OPERATION DIAGRAM





SC 115/215
Knob-adjustable

SC 115/215

- * One shot on energisation and/or de-energisation.
- * Automatic start.
- * Pulse duration: 0.15 - 3 seconds.
- * Knob-adjustable.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication of pulse.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Pulse duration
0.15 - 3 s \pm 20 %.
Pulse on energisation and/or de-energisation.

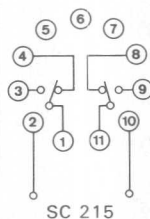
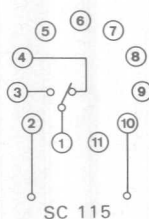
Time adjustment SC 115/215
Knob-adjustable with scale in seconds.
Scale accuracy: \pm 10 %.

Condition of function
The supply voltage must be connected for some time before operation.
See under Mode of Operation.

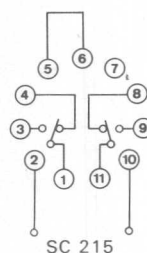
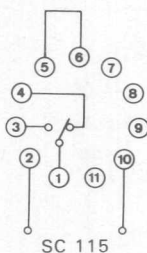
Accessories
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

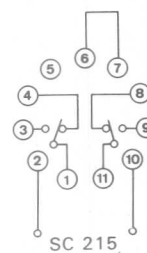
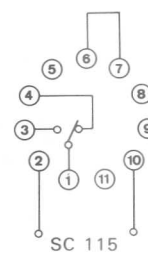
Example 1



Example 2



Example 3



MODE OF OPERATION

Example 1

Pulse on energisation and on de-energisation.

In order to keep the pulse-time within a tolerance of \pm 20 %, the supply voltage must be ON for min. 12 seconds and OFF for min. 4 x set pulse-time.

If greater tolerances can be accepted, the corresponding figures are 3 seconds (ON), and a period slightly longer than the set pulsetime (OFF) respectively.

Example 2

Pulse only on energisation.

In order to keep the pulse-time within a tolerance of \pm 20 %, the supply voltage must be OFF for min. 4 x set pulse time.

If greater tolerances can be accepted, it is sufficient that the supply voltage has been OFF for a period slightly longer than the set pulse-time.

If the supply voltage is interrupted during the pulse time, the relay releases immediately but operates again, as soon as the supply voltage is reapplied.

Example 3

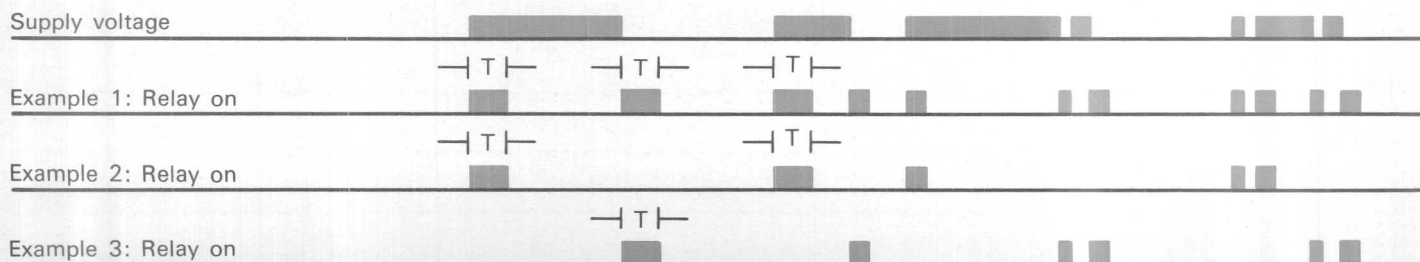
Pulse only on de-energisation.

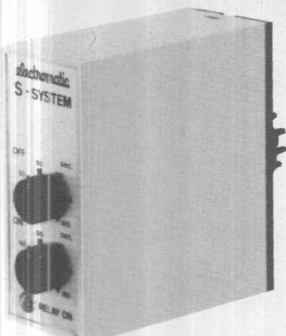
In order to keep the pulse-time within a tolerance of \pm 20 %, the supply voltage must be ON for min. 12 seconds.

If greater tolerances can be accepted, it is sufficient that the supply voltage is ON for 3 seconds.

If the supply voltage is reestablished during the pulse-time, the relay releases immediately, but operates again when the supply voltage is interrupted.

OPERATION DIAGRAM





SC 125/225
Adjustable with
two knobs

SC 125/225

- * Asymmetrical recycler to 600 seconds.
- * Separate time-setting for ON and OFF time.
- * Automatic start in ON or OFF position.
- * Knob-adjustable with two knobs.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

OFF time	/ON time
0.15- 3 s/ 0.15- 3 s	
0.8 - 18 s/ 0.8 - 18 s	
3 - 60 s/ 3 - 60 s	
8 -180 s/ 8 -180 s	
30 -600 s/30 -600 s	

Range accuracy

+ 20 % on max.
- 10 % on min.

Repeatability

OFF time: $\pm 1\%$
ON time: $\pm 1\%$

Max. time variation

Within the limits of rated
supply voltage and ambient
temperature:
OFF time: $\pm 2\%$
ON time: $\pm 2\%$

Reset of time and/or relay

Occurs by disconnecting
the supply voltage for
min. 300 ms.

Time adjustment SC 125/225

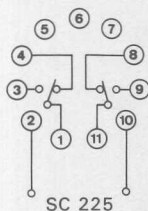
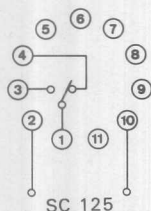
Adjustable with 2 separate
knobs with scales in seconds.
Scale accuracy: $\pm 20\%$.
Top potentiometer:
OFF time.
Bottom potentiometer:
ON time.

Accessories

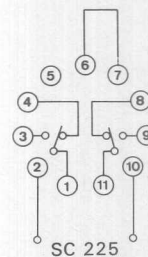
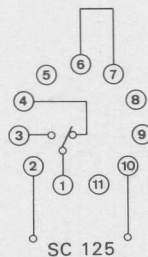
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

Example 1
OFF time first



Example 2
ON time first



MODE OF OPERATION

Example 1

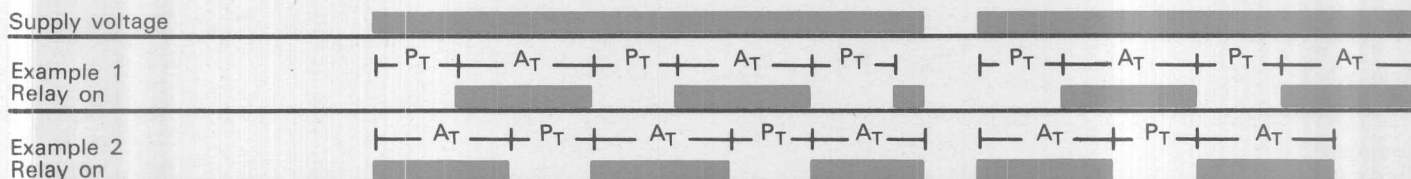
OFF time first.
Apply the supply voltage.
When the set OFF time has expired the
relay will operate and the ON time start.
After the set ON time has elapsed the
relay releases.
The mode of operation restarts and con-
tinues with the set OFF and ON times,
until the supply voltage is disconnected.
If the supply voltage is interrupted for
more than 300 ms the time is reset to
zero, and when the voltage is again con-
nected the S-system restarts in OFF po-
sition.

Example 2

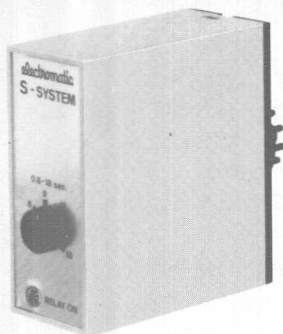
ON time first.
The supply voltage is applied, and be-
cause pins 6 and 7 are interconnected
the relay will operate immediately.
When the set ON time has expired the
relay will release and the OFF time start.
When the set OFF time has expired, the
relay operates again and the mode of
operation continues with the set ON and
OFF times until the supply voltage is dis-
connected.

If the supply voltage is interrupted for
more than 300 ms the time is reset to
zero, and when the voltage is again con-
nected the S-system restarts in ON
position.
Interconnect pins 6 and 7 direct on the
base.

OPERATION DIAGRAM



P_T: OFF time.
A_T: ON time.



SC 135/235
Knob-adjustable

SC 135/235

- * Recycler to 600 seconds OFF time with fixed 0.5 second pulse.
- * Automatic start in OFF or pulse position (ON position).
- * Knob-adjustable OFF time.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SC

SPECIFICATIONS

Common technical data and ordering key
Pages 10–12.

Time ranges OFF time

0.8 – 18 s
3 – 60 s
8 – 180 s
30 – 600 s.

Range accuracy
+ 5 % on max.
– 10 % on min.

Repeatability
OFF time: $\pm 1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 2\%$.

Pulse duration

Fixed 0.5 s $\pm 20\%$.

Reset of time and/or relay

Occurs by disconnecting the supply voltage for min. 300 ms.

Time adjustment

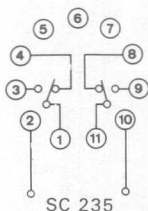
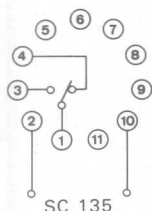
SC 135/235 (OFF time)
Knob-adjustable with scale in seconds.
Scale accuracy: $\pm 10\%$.

Accessories

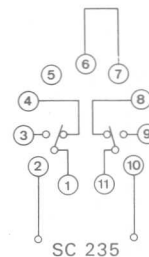
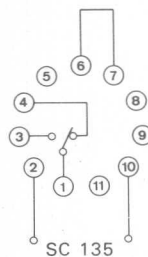
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

Example 1
OFF time first



Example 2
Pulse time first



MODE OF OPERATION

Example 1

OFF time first.

Apply the supply voltage.

When the set OFF time has expired the relay will operate and remain in operation for 0.5 s.

As the relay operates the time is reset, and a new timing period for the OFF time starts at the trailing edge of the pulse. When the OFF time expires the relay operates again for 0.5 s, and this mode of operation continues until the supply voltage is disconnected.

If the supply voltage is disconnected for more than 300 ms the time is reset to zero, and the S-system restarts its mode

of operation with OFF time when the supply voltage is again connected. If the pulse is used to disconnect the supply voltage the duration of the pulse time may be reduced.

Example 2

Pulse time first.

The supply voltage is applied, and because pins 6 and 7 are interconnected the relay will operate immediately for 0.5 s, and the timing period of the set OFF time starts at the trailing edge of the pulse.

After expiration of the pulse time (0.5 s) the relay releases while the timing of the OFF time continues.

When the OFF time has expired the relay again operates for 0.5 s and the OFF time is repeated.

This mode of operation continues until the supply voltage is disconnected. If the supply voltage is disconnected for more than 300 ms the time is reset to zero, and the S-system restarts with a 0.5 s pulse when the voltage is again connected.

If the pulse is used to disconnect the supply voltage the duration of the pulse time may be reduced.

Interconnect pins 6 and 7 direct on the base.

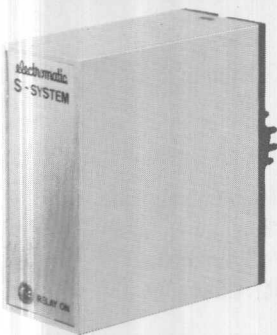
OPERATION DIAGRAM

Supply voltage

Example 1
Relay on

Example 2
Relay on





SC 140/240
External resistor
adjustable

SC 140/240

- * Symmetrical recycler to 180 hours.
- * Equal OFF and ON time.
- * OFF time first.
- * External resistor adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SC

SPECIFICATIONS

**Common technical data
and ordering key**
Pages 10-12.

Time ranges

0.15- 3 s
0.8 - 18 s
3 - 60 s
8 -180 s
0.5 - 10 m
3 - 60 m
8 -180 m
0.5 - 10 h
3 - 60 h
8 -180 h.

Range accuracy

+ 5 % on max.
- 10 % on min.

Repeatability

$\pm 0.1\%$.

Max. time variation

Within the limits of rated
supply voltage and ambient
temperature:
 $\pm 1\%$.

Reset of time and/or relay

Occurs by disconnecting
the supply voltage for
min. 100 ms.

Time adjustment SC 140/240

External resistor or linear re-
mote potentiometer R_T .
0-1 M Ω , 0.25 W.
The external resistor must be
connected before the S-sy-
stem will operate.

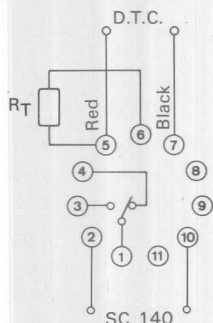
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

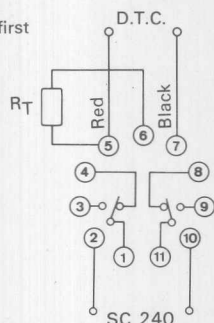
Digital Timer Control

Connection for Digital Timer
Control (D.T.C.) between pins
5 and 7.
Pin 5 positive.
See catalogue on accessories.

WIRING DIAGRAMS



OFF time first



MODE OF OPERATION

OFF time first.

Apply the supply voltage. When the set
OFF time has expired the relay will
operate. When an equal ON time has
elapsed the relay will release. This mode
of operation continues with equal OFF
and ON time periods until the supply
voltage is disconnected.

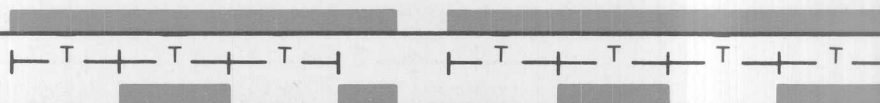
If the supply voltage is interrupted for
more than 100 ms the time is reset to
zero, and when the supply voltage is
again applied the S-system restarts
with OFF time.

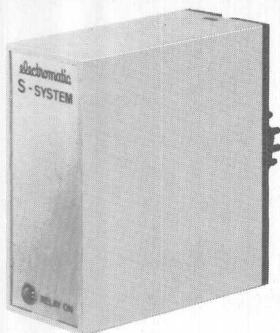
Where ON time first is required, select
SC 141/241.

OPERATION DIAGRAM

Supply voltage

Relay on





SC 141/241
External resistor
adjustable

SC 141/241

- * Symmetrical recycler to 180 hours.
- * Equal OFF and ON time.
- * ON time first.
- * External resistor adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
0.5 - 10 m
3 - 60 m
8 - 180 m
0.5 - 10 h
3 - 60 h
8 - 180 h.

Range accuracy

+ 5 % on max.
- 10 % on min.

Repeatability

$\pm 0.1\%$.

Max. time variation

Within the limits of rated
supply voltage and ambient
temperature:
 $\pm 1\%$.

Reset of time and/or relay

Occurs by disconnecting
the supply voltage for
min. 100 ms.

Time adjustment

SC 141/241

External resistor or linear re-
mote potentiometer R_T .
0-1 M Ω , 0.25 W.
The external resistor must be
connected before the S-sy-
stem will operate.

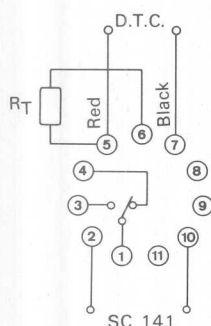
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

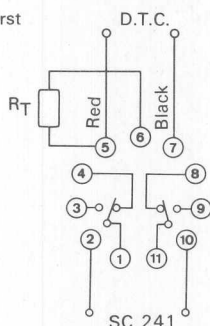
Digital Timer Control

Connection for Digital Timer
Control (D.T.C.) between pins
5 and 7.
Pin 5 positive.
See catalogue on accessories.

WIRING DIAGRAMS



ON time first



MODE OF OPERATION

ON time first.

After connection of the supply voltage
the relay will operate immediately.
After expiry of the set ON time the relay
will release and an OFF time equal to the
ON time begin.

This mode of operation continues with
equal ON and OFF time periods until the
supply voltage is disconnected.

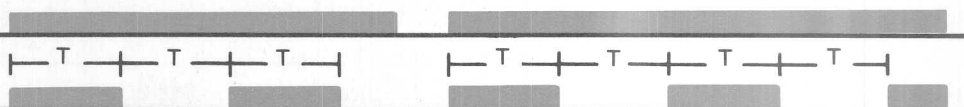
If the supply voltage is interrupted for
more than 100 ms the time is reset to
zero, and when the voltage is again
applied the S-system restarts with
ON time.

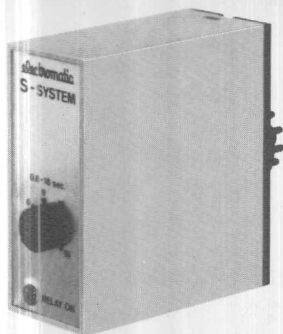
Where OFF time first is required,
select SC 140/240.

OPERATION DIAGRAM

Supply voltage

Relay on





SC 145/245
Knob-adjustable

SC 145/245

- * Symmetrical recycler to 180 hours.
- * Equal OFF and ON time.
- * Automatic start in OFF or ON position.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Time ranges

0.15- 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
0.5 - 10 m
3 - 60 m
8 - 180 m
0.5 - 10 h
3 - 60 h
8 - 180 h.

Range accuracy

+ 5 % on max.
- 10 % on min.

Repeatability

$\pm 0.1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 1\%$.

Reset of time and/or relay

Occurs by disconnecting the supply voltage for min. 100 ms.

Time adjustment SC 145/245

Knob-adjustable with scale in seconds, minutes or hours.
Scale accuracy: $\pm 10\%$.

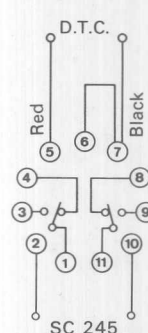
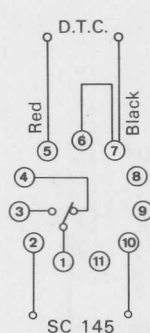
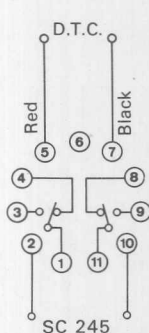
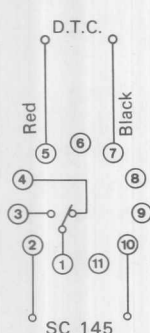
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Digital Timer Control

Connection for Digital Timer Control (D.T.C.) between pins 5 and 7.
Pin 5 positive.
See catalogue on accessories.

WIRING DIAGRAMS



MODE OF OPERATION

Example 1

OFF time first.

Apply the supply voltage. When the set OFF time has expired the relay will operate. When the equal ON time has elapsed the relay will release. This mode of operation continues with equal OFF and ON time periods until the supply voltage is disconnected.

If the supply voltage is interrupted for more than 100 ms the time is reset to zero, and when the supply voltage is again applied the S-system restarts with the OFF time.

Example 2

ON time first.

The supply voltage is applied, and as pins 6 and 7 are interconnected the relay will operate immediately.

After expiry of the set ON time the relay will release and the OFF time equal to the ON time begins.

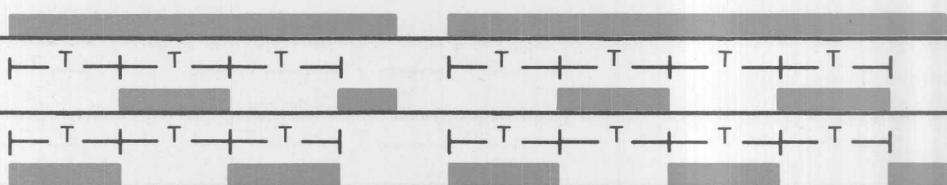
This mode of operation continues with equal ON and OFF time periods until the supply voltage is disconnected. If the supply voltage is interrupted for more than 100 ms the time is reset to zero, and when the voltage is again applied the S-system restarts with ON time.

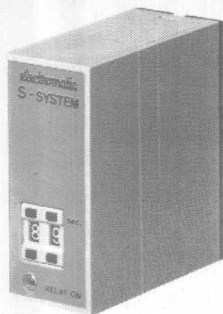
OPERATION DIAGRAM

Supply voltage

Example 1
Relay on

Example 2
Relay on





SC 149/249
Digital switch
adjustable

SC 149/249

- * Symmetrical recycler to 99 hours.
- * Equal OFF and ON time.
- * Automatic start in OFF or ON position.
- * Digital switch-adjustable.
- * Quartz-controlled digital timing circuit.
- * Repeatability: $\pm 0.005\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Time ranges

0.1- 9.9 s
1 -99 s
0.1- 9.9 m
1 -99 m
0.1- 9.9 h
1 -99 h.

Setting accuracy
100 %.

Repeatability
 $\pm 0.005\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
 $\pm 0.01\%$.

Reset of time and/or relay

Occurs by disconnecting supply voltage for min. 100 ms.

Time adjustment
SC 149/249

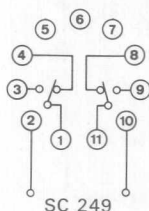
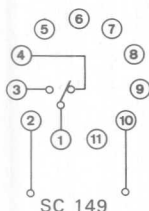
2-digit switch-adjustable.

Accessories

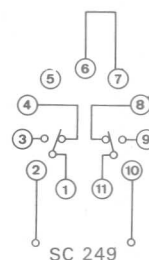
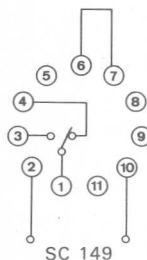
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

Example 1
OFF time first



Example 2
ON time first



MODE OF OPERATION

Example 1

OFF time first.
Apply the supply voltage. When the set OFF time has expired the relay will operate. When an equal ON time has elapsed the relay will release. This mode of operation continues with equal OFF and ON time periods until the supply voltage is disconnected.
If the supply voltage is interrupted for more than 100 ms the time is reset to zero, and when the supply voltage is again applied the S-system restarts with OFF time.

Example 2

ON time first.
The supply voltage is applied, and as pins 6 and 7 are interconnected the relay will operate immediately.
After expiry of the set ON time the relay will release and an OFF time equal to the ON time begin.

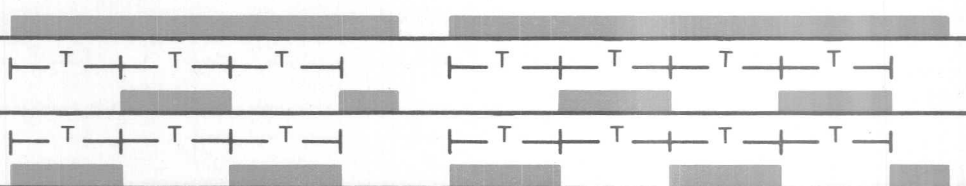
This mode of operation continues with equal ON and OFF time periods until the supply voltage is disconnected. If the supply voltage is interrupted for more than 100 ms the time is reset to zero, and when the voltage is again applied the S-system restarts with ON time.

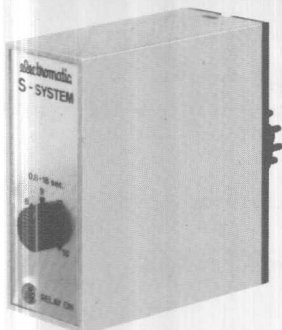
OPERATION DIAGRAM

Supply voltage

Example 1
Relay on

Example 2
Relay on





SC 155/255
Knob-adjustable

SC 155/255

- * Recycler with one knob setting of ON/OFF ratio within a fixed cycle.
- * Automatic start in OFF or ON position.
- * Selection of 5 different cycling times to 600 seconds.
- * Knob-adjustable.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 1\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Time ranges

Full cycle (T)	Relay ON settings (t)
3 s	0.15- 2.85 s
18 s	0.8 - 17.20 s
60 s	3.0 - 57.00 s
180 s	8.0 -172.00 s
600 s.	30.0 -570.00 s.

Periods with relay in OFF position equals T - t.

Range accuracy
+ 5 % on max.
- 10 % on min.

Repeatability
 $\pm 1\%$.

Max time variation
Within the limits of rated supply voltage and ambient temperature:
 $\pm 2\%$.

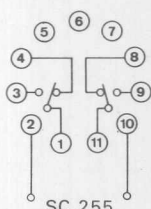
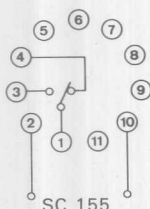
Reset of time and/or relay
Occurs by interruption of the supply voltage for min. 300 ms.

Mutual setting of ON/OFF time
SC 155/255
Knob-adjustable with scale in seconds.
Scale accuracy: $\pm 10\%$.

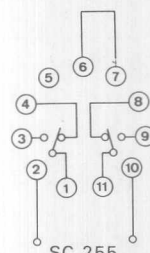
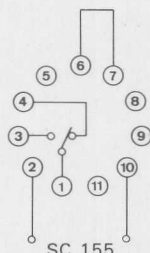
Accessories
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

Example 1
OFF position first



Example 2
ON position first



MODE OF OPERATION

In S-systems SC 155/255 the sum of OFF/ON-periods equals the full cycle time (T).
The selected ON time (t), is set with the knob. The OFF time shall always be equal to the full cycle time (T) minus the set ON time (t).

Example 1
OFF time first.
The supply voltage is applied. The relay remains in OFF position until the resulting OFF time is expired. Then it operates and remains in operating position until the set ON time is expired, whereafter it returns to OFF-position. The recycler shall continue to operate as described until the supply voltage is interrupted. Allow a recovery time of min. 300 ms before the supply voltage is again connected, whereby the recycler shall start in OFF position.

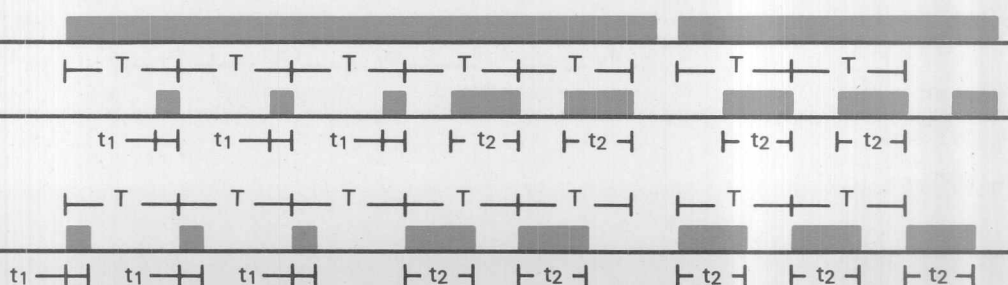
Example 2
ON time first.
The supply voltage is applied. As pins 6 and 7 are in this example interconnected, the relay shall immediately switch to ON-position where it remains for the set time (t), whereafter it returns to OFF-position. When the resulting OFF time is expired, the relay switches back to ON-position. The recycler shall continue to operate as described until the supply voltage is interrupted. Allow a recovery time of min. 300 ms before the voltage is again connected, whereby the recycler shall start in ON-position. The interconnection between pins 6 and 7 must be carried out direct on the base.

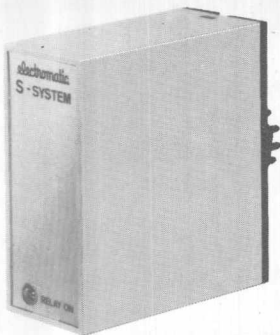
OPERATION DIAGRAM

Supply voltage

Example 1: Relay on

Example 2: Relay on





SC 180
Two external resistors
adjustable

SC 180

- * Asymmetrical recycler to 180 hours.
- * Separate, external resistor adjustable OFF and ON time.
- * OFF time first.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Time ranges

OFF time	/ON time
0.15- 3 s	/0.15- 3 s
0.8 - 18 s	/0.8 - 18 s
3 - 60 s	/3 - 60 s
8 - 180 s	/8 - 180 s
0.5 - 10 m	/0.5 - 10 m
3 - 60 m	/3 - 60 m
8 - 180 m	/8 - 180 m
0.5 - 10 h	/0.5 - 10 h
3 - 60 h	/3 - 60 h
8 - 180 h	/8 - 180 h

Range accuracy
+ 5 % on max.
- 10 % on min.

Repeatability
OFF time: $\pm 0.1\%$
ON time: $\pm 0.1\%$

Max. time variation
Within the limits of rated supply voltage and ambient temperature:
OFF time: $\pm 1\%$
ON time: $\pm 1\%$

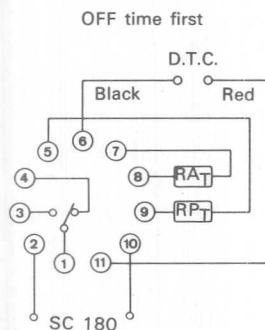
Reset of time and/or relay
Occurs by disconnecting the supply voltage for min. 100 ms.

Time adjustment SC 180
2 external resistors or linear potentiometers.
RP_T: OFF time.
RA_T: ON time.
0-1 M Ω , 0.25 W.
The external resistors must be connected before the S-system will operate.

Accessories
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.
Remote potentiometer kit.

Digital Timer Control
Connection for Digital Timer Control (D.T.C.) between pins 11 and 6.
Pin 11 positive.
See catalogue on accessories.

WIRING DIAGRAM

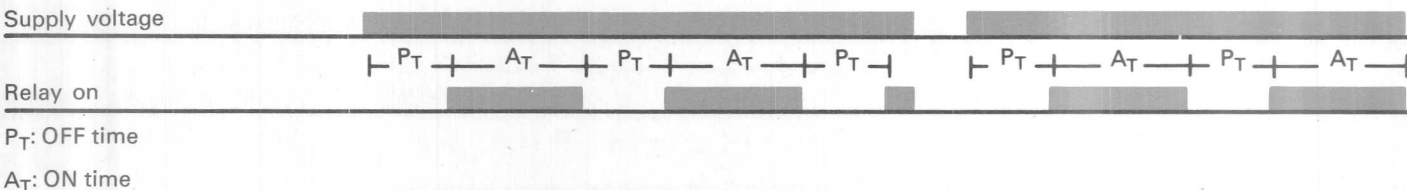


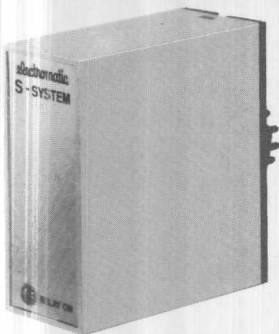
MODE OF OPERATION

OFF time first.
Apply the supply voltage.
When the set OFF time has elapsed the relay will operate and the ON time start.
When the ON time has expired the relay releases and the OFF time starts.
The sequence restarts and continues with the set periods until the supply voltage is disconnected.

If the supply voltage is interrupted for min. 100 ms the time is reset to zero, and when the voltage is again applied the S-system restarts operation with a new OFF time.
Upon request the S-system can be delivered with a combination of different time ranges within the same unit of time, e.g. 0.8 - 18 s/3 - 60 s.
Where ON time first is required, select SC 181.

OPERATION DIAGRAM





SC 181
Two external resistors
adjustable

SC 181

- * Asymmetrical recycler to 180 hours.
- * Separate, external resistor adjustable OFF and ON time.
- * ON time first.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Time ranges

OFF time	/ON time
0.15 - 3 s	/0.15 - 3 s
0.8 - 18 s	/0.8 - 18 s
3 - 60 s	/3 - 60 s
8 - 180 s	/8 - 180 s
0.5 - 10 m	/0.5 - 10 m
3 - 60 m	/3 - 60 m
8 - 180 m	/8 - 180 m
0.5 - 10 h	/0.5 - 10 h
3 - 60 h	/3 - 60 h
8 - 180 h	/8 - 180 h

Range accuracy
+ 5 % on max.
- 10 % on min.

Repeatability
OFF time: $\pm 0.1\%$
ON time: $\pm 0.1\%$

Max. time variation
Within the limits of rated supply voltage and ambient temperature:
OFF time: $\pm 1\%$
ON time: $\pm 1\%$

Reset of time and/or relay
Occurs by disconnecting the supply voltage for min. 100 ms.

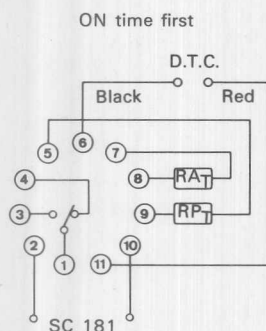
Time adjustment SC 181

2 external resistors or linear potentiometers.
RP_T: OFF time.
RA_T: ON time.
0-1 M Ω , 0.25 W.
The external resistors must be connected before the S-system will operate.

Accessories
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.
Remote potentiometer kit.

Digital Timer Control
Connection for Digital Timer Control (D.T.C.) between pins 11 and 6.
Pin 11 positive.
See catalogue on accessories.

WIRING DIAGRAM



MODE OF OPERATION

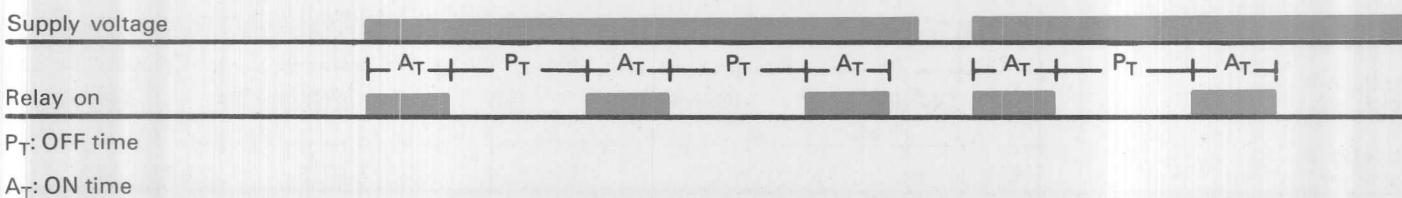
ON time first.

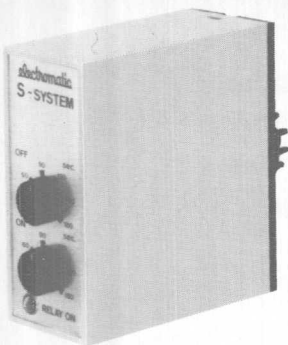
After connection of the supply voltage the relay will operate immediately. When the set ON time has elapsed the relay will release and the OFF time start. When the set OFF time has expired the relay will again operate and the sequence continue with the set periods until the supply voltage is disconnected.

If the supply voltage is interrupted for min. 100 ms the time is reset to zero, and when the voltage is again applied the S-system restarts with a new ON time.

Upon request the S-system can be delivered with a combination of different time ranges within the same unit of time, e.g. 0.8 - 18 s/3 - 60 s. Where OFF time first is required, select SC 180.

OPERATION DIAGRAM





SC 185/285
Two adjustable knobs

SC 185/285

- * Asymmetrical recycler to 180 hours.
- * Automatic start in OFF or ON position.
- * Separate time-setting for OFF and ON time.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Time ranges

OFF time	/ON time
0.15 - 3 s	/0.15 - 3 s
0.8 - 18 s	/0.8 - 18 s
3 - 60 s	/3 - 60 s
8 - 180 s	/8 - 180 s
0.5 - 10 m	/0.5 - 10 m
3 - 60 m	/3 - 60 m
8 - 180 m	/8 - 180 m
0.5 - 10 h	/0.5 - 10 h
3 - 60 h	/3 - 60 h
8 - 180 h	/8 - 180 h

Range accuracy

+ 5 % on max.
- 10 % on min.

Repeatability

OFF time: $\pm 0.1\%$
ON time: $\pm 0.1\%$

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
OFF time: $\pm 1\%$
ON time: $\pm 1\%$

Reset of time and/or relay

Occurs by disconnecting the supply voltage for min. 100 ms.

Time adjustment SC 185/285

2 integral potentiometers with scales in seconds, minutes or hours.
Scale accuracy: $\pm 10\%$.
Top potentiometer:
OFF time.
Bottom potentiometer:
ON time.

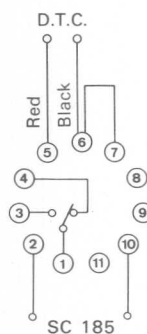
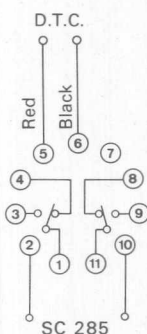
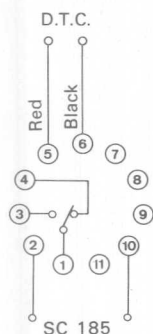
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

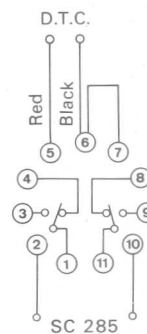
Digital Timer Control

Connection for Digital Timer Control (D.T.C.) between pins 5 and 6.
Pin 5 positive.
See catalogue on accessories.

WIRING DIAGRAMS



Example 2
ON time first



MODE OF OPERATION

Example 1

OFF time first.

Apply the supply voltage.

When the set OFF time has elapsed the relay will operate and the ON time start. When the ON time has expired the relay releases and the OFF time starts.

The sequence continues with the set periods until the supply voltage is disconnected.

If the supply voltage is interrupted for min. 100 ms the time is reset, and when the voltage is again applied the S-system restarts operation with a new OFF time.

Upon request the S-system can be delivered with a combination of different

time ranges within the same unit of time, e.g. 0.8 - 18 s/3 - 60 s.

Example 2

ON time first.

The supply voltage is applied, and because pins 6 and 7 are interconnected the relay will operate immediately.

When the set ON time has elapsed the relay will release and the OFF time start. When the set OFF time has expired the relay will again operate and the sequence continues with the set periods until the supply voltage is disconnected.

If the supply voltage is interrupted for min. 100 ms the time is reset to zero, and when the voltage is again applied the S-system restarts with a new ON

time.

Upon request the S-system can be delivered with a combination of different time ranges within the same unit of time, e.g. 0.8 - 18 s/3 - 60 s.

Adjustment with Digital Timer Control

Connect the S-system as shown in example 1. When supply voltage is now applied the OFF time can be set in a few seconds.

The voltage is disconnected and pins 6 and 7 are interconnected. When the supply voltage is subsequently applied, the S-system will immediately operate and the ON time can be set in a few seconds.

OPERATION DIAGRAM

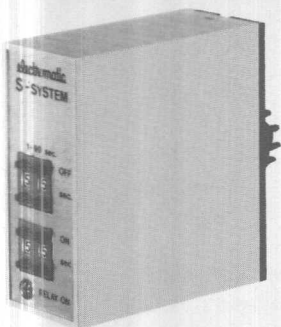
Supply voltage

Example 1
Relay on

Example 2
Relay on

P_T: OFF time

A_T: ON time



SC 189/289
Four adjustable
digital-switches

SC 189/289

- * Asymmetrical recycler to 99 hours.
- * Separate digital switch-adjustable time-setting for OFF and ON time.
- * Automatic start in OFF or ON position.
- * Quartz-controlled digital timing circuit.
- * Repeatability: $\pm 0.005\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

**Common technical data
and ordering key**
Pages 10–12.

Time ranges

OFF time	/ON time
0.1–9.9 s	/0.1–9.9 s
1–99 s	/1–99 s
0.1–9.9 m	/0.1–9.9 m
1–99 m	/1–99 m
0.1–9.9 h	/0.1–9.9 h
1–99 h	/1–99 h

Setting accuracy
100 %.

Repeatability

OFF time: $\pm 0.005\%$.
ON time: $\pm 0.005\%$.

Max. time variation

Within the limits of rated
supply voltage and ambient
temperature:
OFF time: $\pm 0.01\%$.
ON time: $\pm 0.01\%$.

Reset of time and/or relay

Occurs by disconnecting
the supply voltage
for min. 100 ms.

Time adjustment SC 189/289

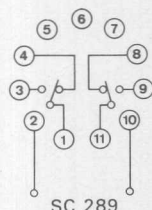
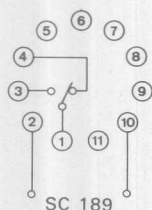
Two 2-digit time selectors
with independent adjustment
of ON and OFF time.
Top switches:
OFF time.
Bottom switches:
ON time.

Accessories

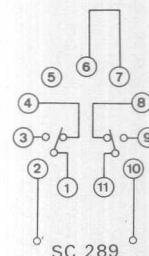
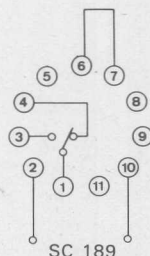
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

Example 1
OFF time first



Example 2
ON time first



MODE OF OPERATION

Example 1

OFF time first.

Apply the supply voltage.

When the set OFF time has elapsed the
relay will operate and the ON time start.
When the ON time has expired the relay
releases and the OFF time starts.

The sequence restarts and continues
with the set periods until the supply vol-
tage is disconnected.

If the supply voltage is interrupted for
min. 100 ms the time is reset to zero,
and when the voltage is again applied
the S-system restarts operation with a
new OFF time.

SC 189/289 cannot be delivered with a
combination of different time ranges.

Example 2

ON time first.

The supply voltage is applied, and be-
cause pins 6 and 7 are interconnected
the relay will operate immediately.

When the set ON time has elapsed the
relay will release and the OFF time start.
When the set OFF time has expired the
relay will again operate and the sequen-
ce continue with the set periods until the
supply voltage is disconnected.

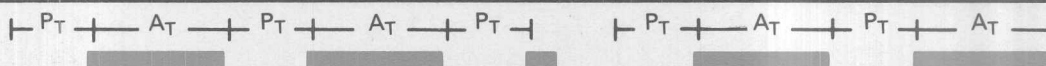
If the supply voltage is interrupted for
min. 100 ms the time is reset to zero,
and when the voltage is again applied
the S-system restarts with a new ON
time.

SC 189/289 cannot be delivered with a
combination of different time ranges.

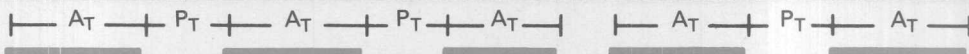
OPERATION DIAGRAM

Supply voltage

Example 1
Relay on

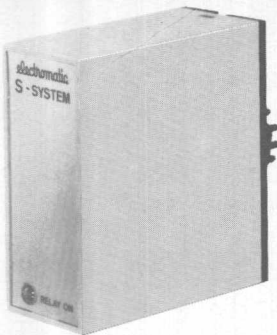


Example 2
Relay on



P_T: OFF time

A_T: ON time



SC 190/290
External resistor
adjustable

SC 190/290

- * Recycler to 180 hours OFF time with fixed 0.5 second pulse.
- * External resistor adjustable OFF time.
- * OFF time first.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10–12.

Time ranges OFF time

0.8	– 18 s
3	– 60 s
8	– 180 s
0.5	– 10 m
3	– 60 m
8	– 180 m
0.5	– 10 h
3	– 60 h
8	– 180 h

Range accuracy
+ 5 % on max.
– 10 % on min.

Repeatability
OFF time: $\pm 0.1\%$.

Max. time variation
Within the limits of rated supply voltage and ambient temperature:
OFF time: $\pm 1\%$.

Pulse duration
Fixed 0.5 s $\pm 20\%$.

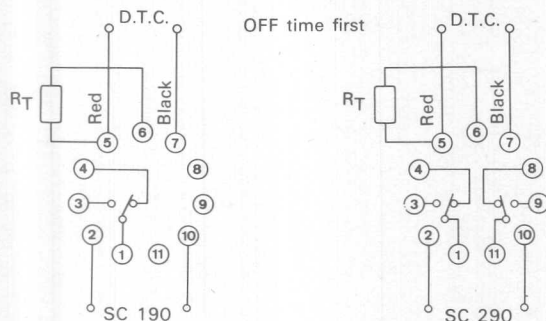
Reset of time and/or relay
Occurs by disconnecting the supply voltage for min. 100 ms.

Time adjustment SC 190/290
External resistor or linear remote potentiometer R_T .
0–1 M Ω , 0.25 W.
The external resistor must be connected before the S-system will operate.

Accessories
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.
Remote potentiometer kit.

Digital Timer Control
Connection for Digital Timer Control (D.T.C.) between pins 5 and 6.
Pin 5 positive.
See catalogue on accessories.

WIRING DIAGRAMS



MODE OF OPERATION

OFF time first.

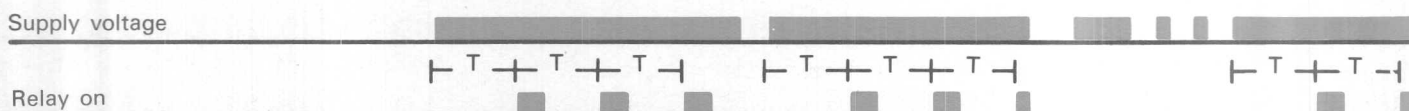
Apply the supply voltage. When the set OFF time has elapsed the relay will operate and remain in operating position for 0.5 s.

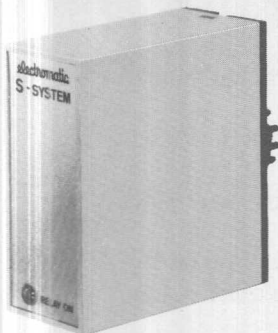
While the relay operates the time is reset to zero, and a new OFF period starts. When the set OFF delay has expired the relay will again operate for 0.5 s, and this sequence continues, until the supply voltage is disconnected.

If the supply voltage is interrupted for min. 100 ms the time is reset to zero, and the S-system restarts with an OFF time when the voltage is again connected.

If the pulse is employed to interrupt the supply voltage the duration of the pulse may be reduced.
Where ON time first is required, select SC 191/SC 291.

OPERATION DIAGRAM





SC 191/291
External resistor
adjustable

SC 191/291

- * Recycler to 180 hours OFF time with fixed 0.5 second pulse.
- * External resistor adjustable OFF time.
- * Pulse time first.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Time ranges OFF time

0.8 - 18 s
3 - 60 s
8 - 180 s
0.5 - 10 m
3 - 60 m
8 - 180 m
0.5 - 10 h
3 - 60 h
8 - 180 h.

Range accuracy
+ 5 % on max.
- 10 % on min.

Repeatability
OFF time: $\pm 0.1\%$.

Max. time variation
Within the limits of rated supply voltage and ambient temperature:
OFF time: $\pm 1\%$.

Pulse duration
Fixed 0.5 s $\pm 20\%$.

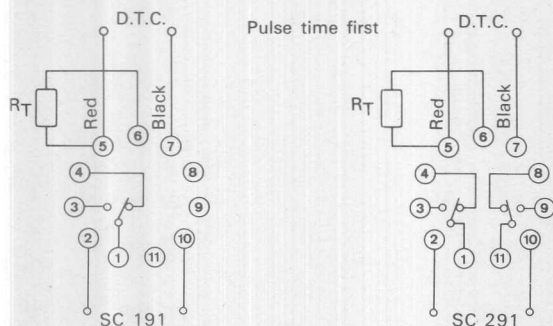
Reset of time and/or relay
Occurs by disconnecting the supply voltage for min. 100 ms.

Time adjustment SC 191/291
External resistor or linear remote potentiometer R_T .
0-1 M Ω , 0.25 W.
The external resistor must be connected before the S-system will operate.

Accessories
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Digital Timer Control
Connection for Digital Timer Control (D.T.C.) between pins 5 and 7.
Pin 5 positive.
See catalogue on accessories.

WIRING DIAGRAMS



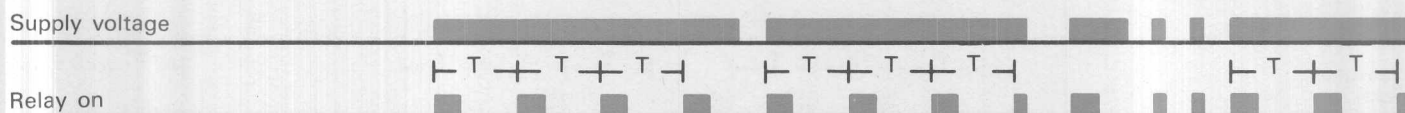
MODE OF OPERATION

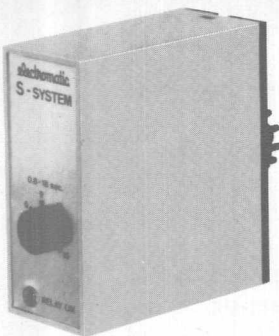
Pulse time first.

After connection of the supply voltage the relay will immediately operate for 0.5 s, and at the front edge of the pulse the timing of the set OFF time will commence.
After expiration of the fixed pulse (0.5 s) the relay will release, and the timing of the delay period continues.
At the end of the OFF time the relay will again operate for 0.5 s. Now a new OFF time starts.

This mode of operation continues until the supply voltage is disconnected. If the supply voltage is interrupted for min. 100 ms the time is reset to zero, and when the voltage is again applied the S-system starts with a pulse (0.5 s).
If the pulse is employed to disconnect the supply voltage the pulse duration may be reduced.
Where OFF time first is required, select SC 190/290.

OPERATION DIAGRAM





SC 195/295
Knob-adjustable

SC 195/295

- * Recycler to 180 hours OFF time with fixed 0.5 second pulse.
- * Automatic start in OFF or pulse position.
- * Knob-adjustable OFF time.
- * Oscillator-controlled binary timing circuit.
- * Repeatability: $\pm 0.1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Time ranges OFF time

0.8 - 18 s
3 - 60 s
8 - 180 s
0.5 - 10 m
3 - 60 m
8 - 180 m
0.5 - 10 h
3 - 60 h
8 - 180 h.

Range accuracy
+ 5 % on max.
- 10 % on min.

Repeatability
OFF time: $\pm 0.1\%$.

Max. time variation
Within the limits of rated supply voltage and ambient temperature:
OFF time: $\pm 1\%$.

Pulse duration
Fixed 0.5 s $\pm 20\%$.

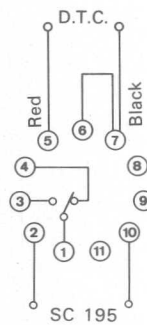
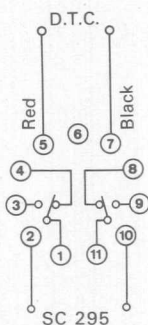
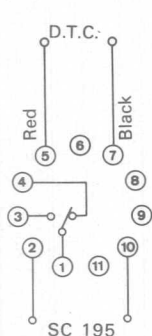
Reset of time and/or relay
Occurs by disconnecting the supply voltage for min. 100 ms.

Time adjustment SC 195/295
Knob-adjustable OFF time with scale in seconds, minutes or hours.
Scale accuracy: $\pm 10\%$.

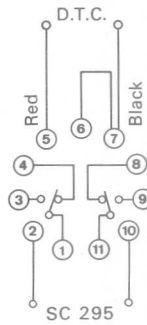
Accessories
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Digital Timer Control
Connection for Digital Timer Control (D.T.C.) between pins 5 and 7.
Pin 5 positive.
See catalogue on accessories.

WIRING DIAGRAMS



Example 2
Pulse time first



MODE OF OPERATION

Example 1

OFF time first.
Apply the supply voltage. When the set OFF time has elapsed the relay will operate and remain in operating position for 0.5 s.
While the relay operates the time is reset to zero, and a new OFF period starts. When the set OFF delay has expired the relay will again operate for 0.5 s, and this sequence continues until the supply voltage is disconnected. If the supply voltage is interrupted for min. 100 ms the time is reset to zero, and the S-system restarts with an OFF time when the voltage is again connected.

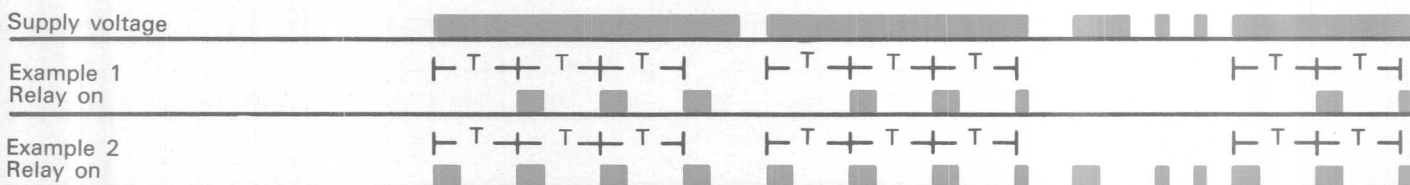
If the pulse is employed to disconnect the supply voltage the duration of the pulse may be reduced.

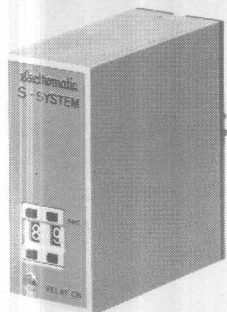
Example 2

Pulse time first.
The supply voltage is applied, and because pins 6 and 7 are interconnected the relay will immediately operate for 0.5 s, and at the front edge of the pulse the timing of the set OFF time will commence.
After expiration of the fixed pulse (0.5 s) the relay will release, and the timing of the OFF period continues.

At the end of the OFF time the relay will again operate for 0.5 s. Now a new OFF time starts.
This mode of operation continues until the supply voltage is disconnected. If the supply voltage is interrupted for min. 100 ms the time is reset to zero, and when the voltage is again applied the S-system starts with a pulse (0.5 s). If the pulse is employed to disconnect the supply voltage the pulse duration may be reduced.

OPERATION DIAGRAM





SC 199/299
Digital switch
adjustable

SC 199/299

- * Recycler to 99 hours OFF time with fixed 0.5 second pulse.
- * Digital switch-adjustable OFF time.
- * Automatic start in OFF or pulse position.
- * Quartz-controlled digital timing circuit.
- * Repeatability: $\pm 0.005\%$.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10–12.

Time ranges

OFF time

1 –99 s
0.1– 9.9 m
1 –99 m
0.1– 9.9 h
1 –99 h.

Setting accuracy
100 %.

Repeatability

OFF time: $\pm 0.005\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature:
OFF time: $\pm 0.01\%$.

Reset of time and/or relay

Occurs by disconnecting the supply voltage for min. 300 ms.

Pulse duration

Fixed 0.5 s $\pm 20\%$.

Time adjustment SC 199/299

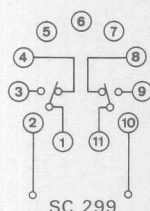
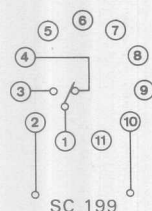
2-digit switch-adjustable OFF time.

Accessories

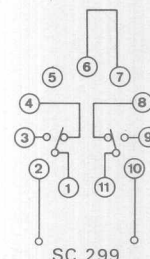
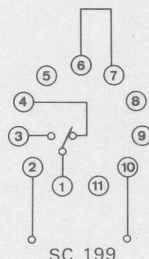
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

Example 1
OFF time first



Example 2
Pulse time first



MODE OF OPERATION

Example 1

OFF time first.

Apply the supply voltage. When the set OFF time has elapsed the relay will operate and remain in operating position for 0.5 s.

While the relay operates the time is reset to zero, and a new OFF period starts. When the set OFF delay has expired the relay will again operate for 0.5 s, and this sequence continues until the supply voltage is disconnected. If the supply voltage is interrupted for min. 300 ms the time is reset to zero, and the S-system restarts with an OFF time when the voltage is again connected.

If the pulse is employed to disconnect the supply voltage the duration of the pulse may be reduced.

Example 2

Pulse time first.

The supply voltage is applied, and because pins 6 and 7 are interconnected the relay will immediately operate for 0.5 s, and at the front edge of the pulse the timing of the set OFF time will commence.

After expiration of the fixed pulse (0.5 s) the relay will release, and the timing of the OFF period continues.

At the end of the OFF time the relay will again operate for 0.5 s. Now a new OFF time starts.

This mode of operation continues until the supply voltage is disconnected.

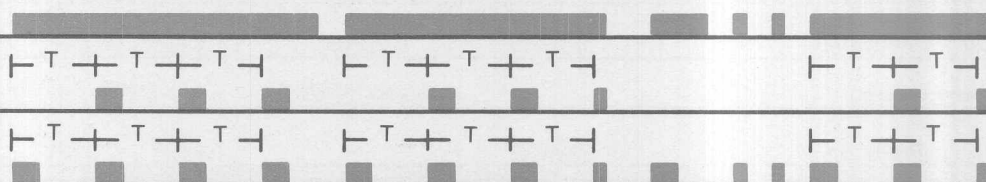
If the supply voltage is interrupted for min. 300 ms the time is reset to zero, and when the voltage is again applied the S-system starts with a pulse (0.5 s). If the pulse is employed to disconnect the supply voltage the pulse duration may be reduced.

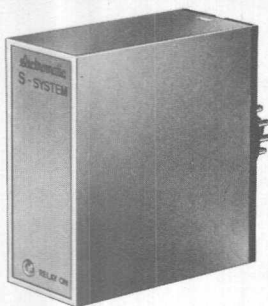
OPERATION DIAGRAM

Supply voltage

Example 1
Relay on

Example 2
Relay on





SD 110/210

- * Relay for inductive and capacitive sensors without amplifier (NAMUR).
- * Voltage- and current limitation in sensor circuit (8 VDC, 8 mA).
- * Relay locks in »OFF« position by cable failures.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC or DC supply voltage.

SD 110/210
No adjustment

SPECIFICATIONS

Common technical data and ordering key

Pages 10–12.

Sensor voltage

Pins 5–6 or 6–7:
8 VDC.
Pin 6 positive.

Sensor current

Activated: < 1 mA
Not activated: > 3 mA

Short-circuit current

Max. 8 mA.

Connection cable

Unshielded PVC core.
Can be extended if required,
maximum resistance:
100 Ω .

Sensing range

0.5–40 mm depending on the
sensor.
See sensor specifications.

Sensing speed

Max. 10 operations/s.

Pulse time

Min. 20 ms.

Subject of detection

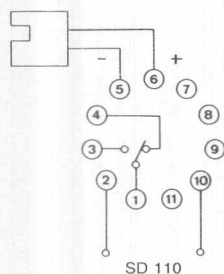
Solid, fluid, or granulated
substances.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

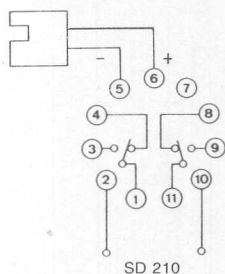
Inductive sensors, type DU,
DJ and DO. Capacitive sen-
sors, type DR.
See catalogue on accessories.

WIRING DIAGRAM

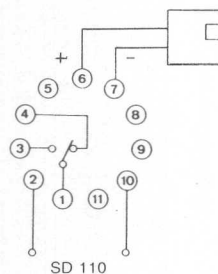


SD 110

Example 1

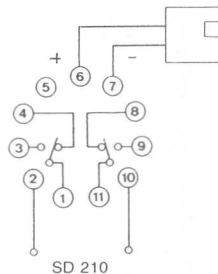


SD 210



SD 110

Example 2



SD 210

MODE OF OPERATION

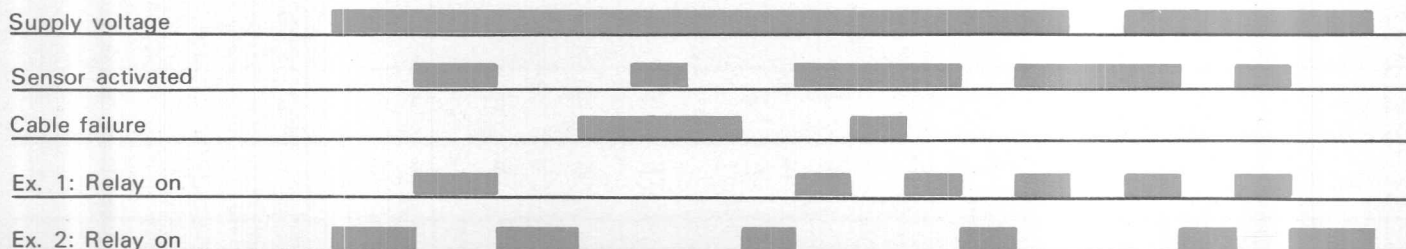
Example 1

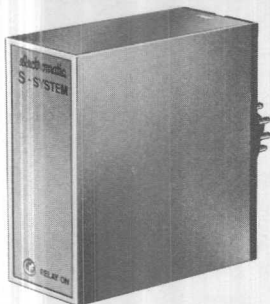
The relay operates by activation of
the sensor.
It releases automatically in case of
cable failure.

Example 2

The relay releases by activation of
the sensor.
It releases automatically in case of
cable failure.

OPERATION DIAGRAM





SD 170/270

- * Bistable relay for 2 inductive or capacitive sensors without amplifier (NAMUR).
- * Voltage- and current limitation in sensor circuits (8 VDC, 8 mA).
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC or DC supply voltage.

SD 170/270
No adjustment

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Sensor voltage

Pins 5-6 or 6-7:
8 VDC.
Pin 6 positive.

Sensor current

Activated: < 1 mA
Not activated: > 3 mA

Short-circuit current

Max. 8 mA.

Connection cable

Unshielded PVC core.
Can be extended if required,
maximum resistance:
100 Ω .

Sensing range

0.5-40 mm depending on the
sensor.
See sensor specifications.

Sensing speed

Max. 10 operations/s.

Pulse time

Min. 20 ms.

Subject of detection

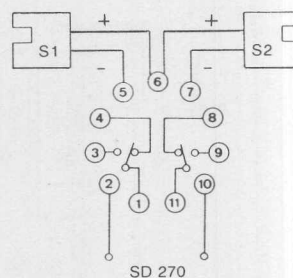
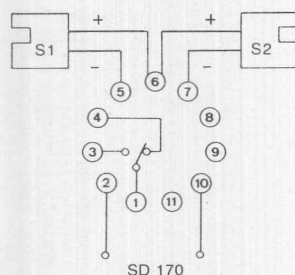
Solid, fluid, or granulated
substances.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Inductive sensors, type DU,
DJ and DO.
Capacitive sensors, type DR.
See catalogue on accessories.

WIRING DIAGRAM



MODE OF OPERATION

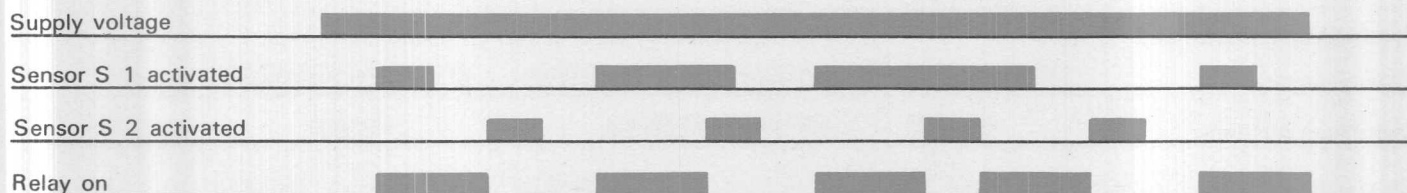
The SD 170/270, being bistable relays, are used with 2 proximity sensors in the following way:

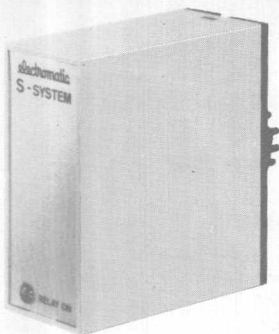
The relay operates when one of the sensors (S 1) is activated momentarily and then remains operated.

When the other sensor (S 2) is activated momentarily, or when the supply voltage is interrupted, the relay releases.

If both sensors are activated at the same time, the relay releases, or shall not operate respectively. Sensor S 2 has priority.

OPERATION DIAGRAM





SE 100
No adjustment

SE 100

- * Relay for photosensors with unmodulated, infrared light.
- * Built-in power supply for transmitter/receiver.
- * 2 types of separate transmitters and receivers with operating range: Max. 200 mm.
- * 1 type of combined transmitter and receiver with operating range: Max. 30 mm.
- * Transmitter- and receiver connections are short-circuit safe.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Frequency
Max. 10 pulses/s.

Duration of light/darkness
Both: Min. 50 ms.

Connections for transmitters
Voltage/current:
1,4 VDC - 100 mA.

Connection:
Pins 6 and 7.
Pin 7 positive.
Short-circuit safe.

Connections for receivers
Voltage: 30 VDC.
Current: Lit: 3 - 5 mA.
Dark: < 10 μ A.

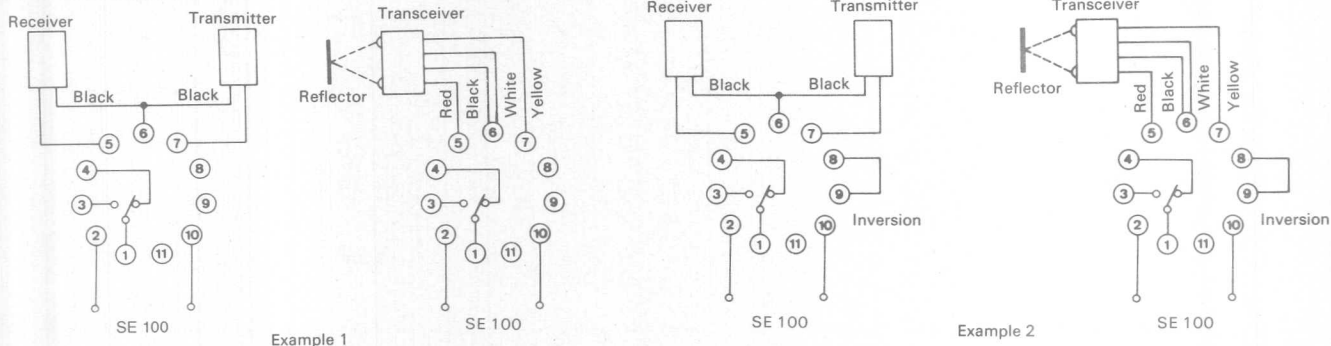
Short-circuit current:
5 mA.

Connection:
Pins 5 and 6.
Pin 5 positive.
Short-circuit safe.

Accessories
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Infrared transmitters, type IT/ITA.
Infrared receivers, type IR/IRA.
Combined, infrared transmitter and receiver, type IRE.
Reflectors.
See catalogue on accessories.

WIRING DIAGRAMS



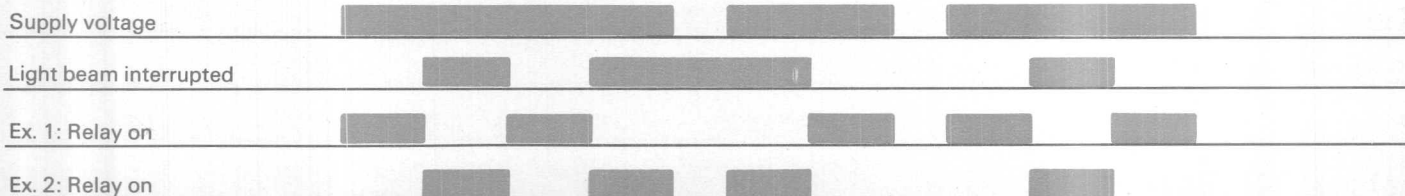
MODE OF OPERATION

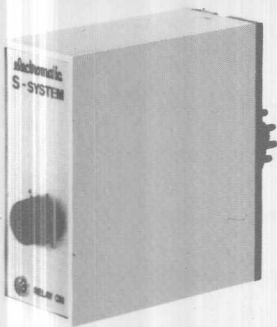
The relay is used in conjunction with photosensors type ITR/ITRA and retro-reflective head type IRE. The photosensors work with infrared, unmodulated light. The transmitter is a Ga-As diode and the receiver is a phototransistor.

Example 1: The relay releases, when the light beam is interrupted. The relay also releases in case one or more of the cables between the photosensors and the SE 100 are disconnected and in case of power failure.

Example 2: The relay operates, when the light beam is interrupted. The relay also operates in case one or more of the cables between the photosensors and the SE 100 are disconnected.

OPERATION DIAGRAM





SE 105
Knob-adjustable

SE 105

- * Relay for photosensors with unmodulated, infrared light.
- * Built-in power supply for transmitter/receiver.
- * Adjustment of sensitivity by potentiometer.
- * 2 types of separate transmitters and receivers with maximum operating range: 200 mm.
- * 1 type of combined transmitter and receiver with maximum operating range: 30 mm.
- * 10 A SPDT output relay.
- * LED-indication of relay position.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Frequency

Max. 10 pulses/s.

Duration of light/darkness

Each: Min. 50 ms.

Connections for transmitters

Voltage/current:

1.4 VDC at max. 100 mA.

If the required current, I_o , is smaller than 100 mA, a series resistor, R_s , is inserted.

The value of R_s is determined by the following equation:

$$R_s = \frac{1.8 \times 10^3 (V)}{I_o (mA)} - 18 (\Omega)$$

Connection:

Pins 6 and 7.

Pin 7 positive.

Short-circuit safe.

Connections for receivers

Idle voltage: 15 VDC.

Short-circuit current: 5 mA.

Current: Lit: 100 μ A - 5 mA.

Dark: < 1 μ A.

Adjustment of sensitivity:

Place the object where you want it to be detected. Now, adjust the potentiometer till the relay operates. (At inverted function until the relay releases).

From that setting of the potentiometer the knob is turned one graduation mark further on the scale towards the maximum setting of the potentiometer.

Connection:

Pins 5 and 6. Pin 5 positive.

Short-circuit safe.

Accessories

Bases.

Hold down spring.

Mounting rack.

Base covers.

Front mounting bezel.

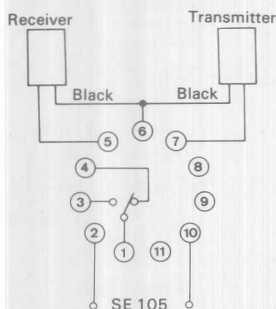
Infrared transmitters type IT/ITA.

Infrared receivers type IR/IRA.

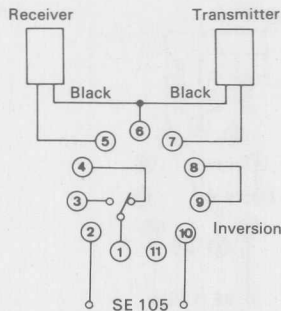
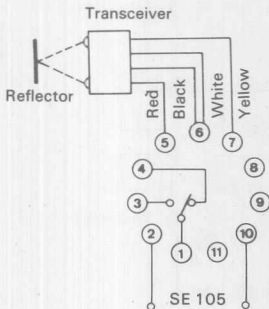
Combined infrared transmitter and receiver (transceiver) type IRE.

Reflectors.

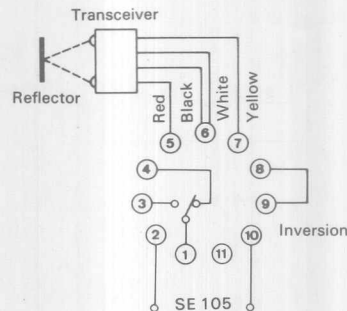
WIRING DIAGRAMS



Example 1



Example 2



MODE OF OPERATION

The amplifier is used in conjunction with unmodulated transmitters and receivers. Detection by reflection can be carried out either by using a reflector, type ER, or various materials such as plastics, textiles, metal, paper, glass and wood.

Example 1

The relay releases, when the light beam is interrupted. The relay also releases in case one or more of the cables between the photosensors and the SE 105 are disconnected and in case of power failure.

Example 2

The relay operates, when the light beam is interrupted. The relay also operates in case one or more of the cables between the photosensors and the SE 105 are disconnected.

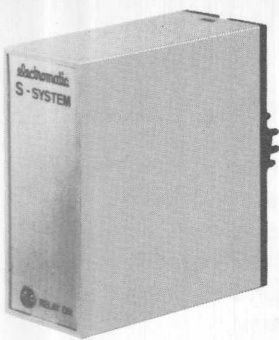
OPERATION DIAGRAM

Supply voltage

Light beam interrupted

Ex. 1: Relay on

Ex. 2: Relay on



SE 110
No adjustment

SE 110

- * Relay for photosensors with modulated, infrared light.
- * Built-in power supply for transmitter/-receiver.
- * For separate transmitters and receivers with max. ranges: 1 to 100 metres.
- * For combined transmitters and receivers with max. ranges: 1 to 10 metres.
- * Transmitter- and receiver connections are short-circuit safe.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Frequency

Max. 10 pulses/s.

Duration of light/darkness

Both: Min. 50 ms.

Connections for transmitters

Voltage/current:
3,5 VDC - 100 mA.

Idle voltage:
5 VDC.

Short-circuit current:
500 mA.

Connection:
Pins 6 and 7.
Pin 7 positive.
Short-circuit safe.

Connections for receivers

Voltage: 12 VDC.

Current: Lit: 15 mA
Dark: 1 to 4 mA.

Idle voltage:
12 VDC.

Short-circuit current:
75 mA.

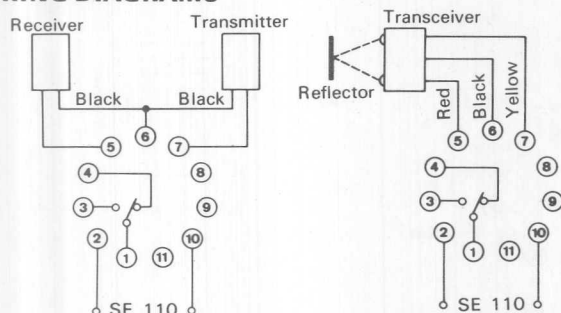
Connection:
Pins 5 and 6.
Pin 5 positive.
Short-circuit safe.

Accessories

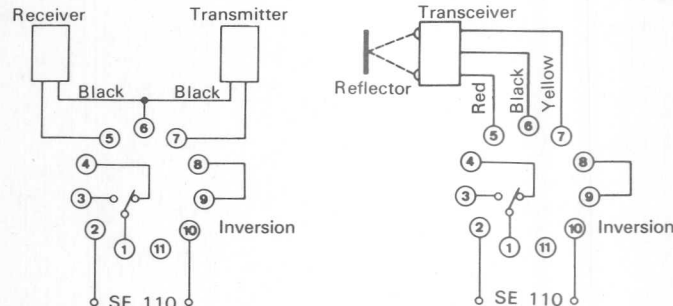
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Infrared transmitters.
Infrared receivers.
Combined infrared transmitters and receivers.
Reflectors.
Separate power supply for special applications, type SE 010.
See catalogue on accessories.

WIRING DIAGRAMS



Example 1



Example 2

MODE OF OPERATION

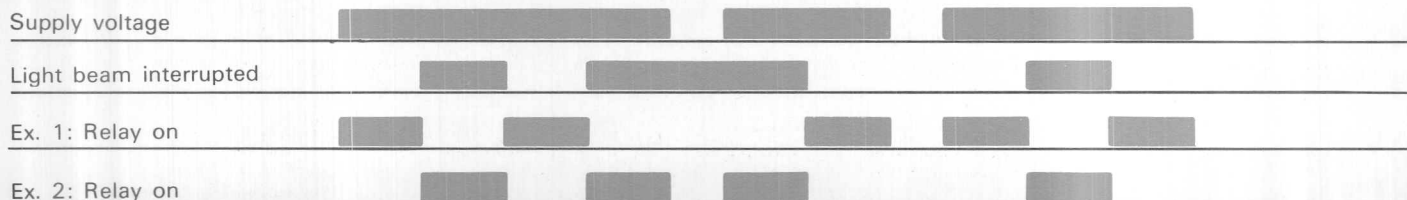
The relay is used in conjunction with separate, infrared transmitters and receivers and retro-reflective heads. The photosensors work with infrared, modulated light and because of the modulation they are insensitive to environmental light. The transmitter is a Ga-As diode and the receiver is a phototransistor.

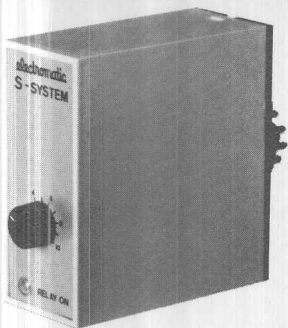
When sensing by reflection either a reflector type ER or other materials can be used, such as plastics, textiles, metal, wood, paper, glass, etc.

Example 1: The relay releases, when the light beam is interrupted. The relay also releases in case one or more of the cables between the photosensors and the SE 110 are disconnected and in case of power failure.

Example 2: The relay operates, when the light beam is interrupted. The relay also operates in case one or more of the cables between the photosensors and the SE 110 are disconnected.

OPERATION DIAGRAM





SE 125
Knob-adjustable

SE 125

- * Relay for temperature sensors and other resistive sensors.
- * Resistance value: 2 - 200 K Ω .
- * Knob- or external resistor adjustable.
- * 3 different types of temperature sensors with temperature ranges from - 25°C to + 250°C.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Measuring range
2 - 200 K Ω .

Hysteresis
Approx. 10 %.

Measuring voltage
10 VDC.
Pin 5 positive.
Pin 7 negative.

Frequency
Max. 10 pulses/s.

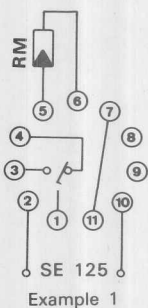
Measuring resistor (RM)
All variable resistors or diodes where the working range is inside the measuring range of the relay.
N.B. Ensure correct polarity of diodes.

Reference resistor (RR)
Either the built-in potentiometer or an external resistor/potentiometer (1/4 W) are used for reference.
Alternatively, a fixed resistor with high ohmic value and a potentiometer with low ohmic value, connected in series, are used to achieve more accurate setting.

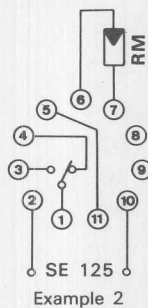
Accessories
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Remote potentiometer kit.
Temperature sensors, type ETS 1, ETS 2 and ETS 3.
See catalogue on accessories.

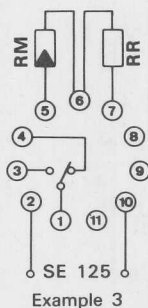
WIRING DIAGRAMS



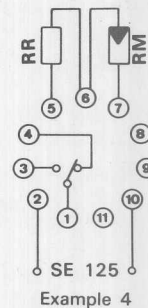
Example 1



Example 2



Example 3



Example 4

MODE OF OPERATION

Example 1: The relay operates when the measuring resistor (RM) is greater than the adjustment of the built-in potentiometer.

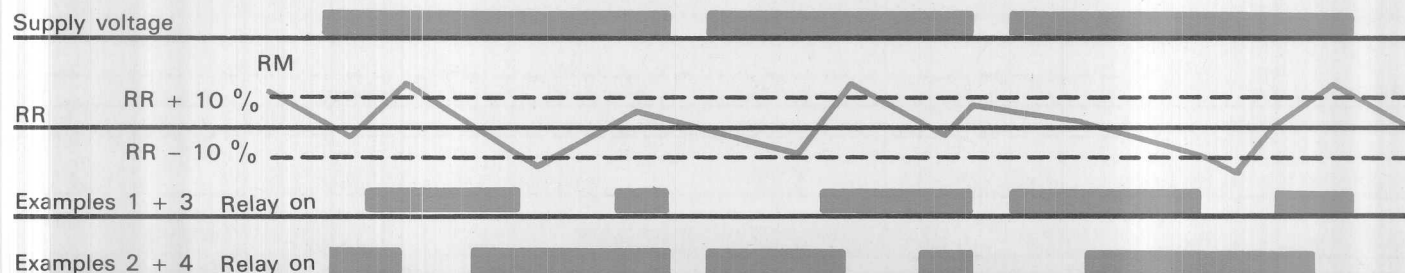
Example 2: The relay operates when the measuring resistor (RM) is less than the adjustment of the built-in potentiometer.

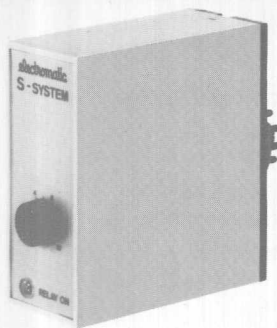
Example 3: The relay operates when the measuring resistor (RM) is greater than the reference resistor (RR).

Example 4: The relay operates when the measuring resistor (RM) is less than the reference resistor (RR).

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

OPERATION DIAGRAM





SE 135
Knob-adjustable

SE 135

- * Relay for various variable resistors or diodes.
- * Resistance value: 50 Ω to 500 K Ω .
- * Knob- or external resistor adjustable.
- * 3 different types of temperature sensors with temperature ranges: -25°C to + 250°C.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Measuring range

2 measuring ranges:
50 - 5000 Ω .
0.5 - 500 K Ω .

Hysteresis

< 1 %.

Measuring voltage

Ranges:
50.0 - 5000 Ω : 1.4 VDC
0.5 - 500 K Ω : 8.2 VDC

Pin 5 positive.
Pin 7 negative.

Frequency

Max. 1 pulse/s.

Measuring resistor (RM)

All types of variable resistors or diodes, e.g. photo-, thermo-, magnetic- and humidity resistors where the working range is inside the measuring range of the relay.
N.B. Ensure correct polarity of diodes.

Reference resistor (RR)

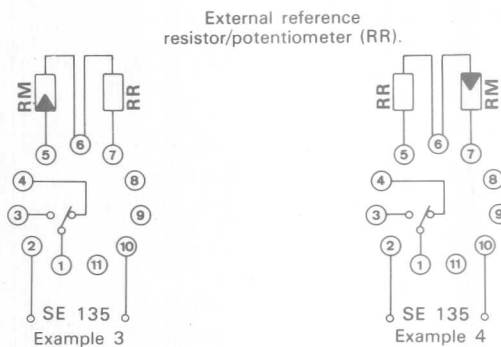
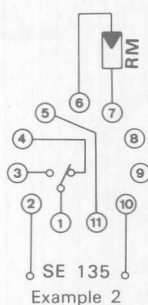
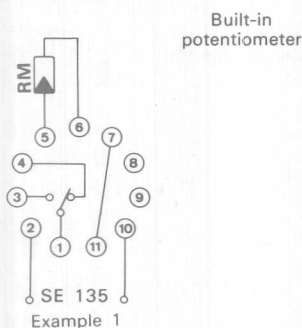
Either the built-in potentiometer or an external resistor/potentiometer (1/4 W) are used for reference.
Alternatively, a fixed resistor with high ohmic value and a potentiometer with low ohmic value, connected in series, are used to achieve more accurate setting.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Remote potentiometer kit.
Temperature sensors, type ETS 1, ETS 2 and ETS 3.
See catalogue on accessories.

WIRING DIAGRAMS



MODE OF OPERATION

Example 1: The relay operates when the measuring resistor (RM) is greater than the adjustment of the built-in potentiometer.

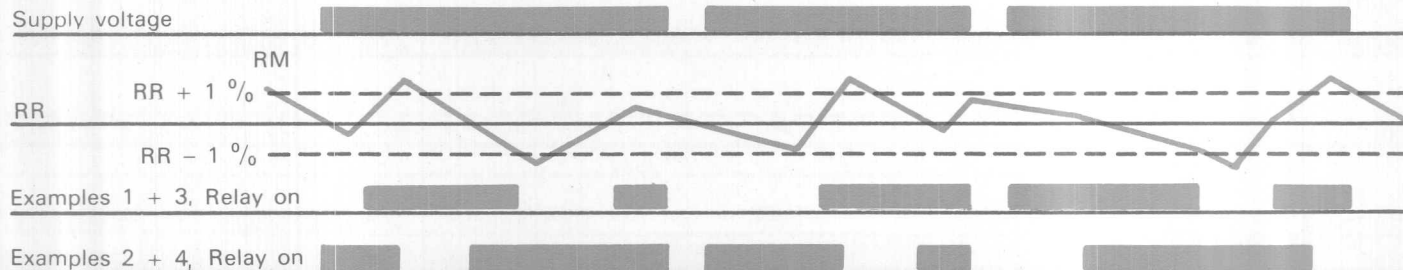
Example 2: The relay operates when the measuring resistor (RM) is less than the adjustment of the built-in potentiometer.

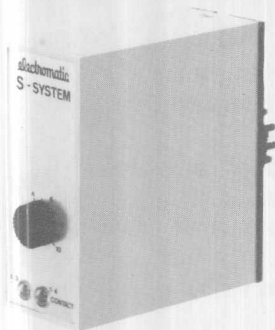
Example 3: The relay operates when the measuring resistor (RM) is greater than the reference resistor (RR).

Example 4: The relay operates when the measuring resistor (RM) is less than the reference resistor (RR).

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

OPERATION DIAGRAM





SE 155
Knob-adjustable

SE 155

- * Differential relay for various variable resistors or diodes.
- * Resistance value: 50 Ω - 500 K Ω .
- * Knob- or external resistor adjustable.
- * 3 different types of temperature sensors with the temperature range: - 25°C to + 250°C.
- * 10 A SPDT output relay with neutral centre position.
- * LED-indications of both relay positions.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Measuring range

2 measuring ranges:
50 - 5000 Ω .
0.5 - 500 K Ω .

Hysteresis

< 1 %.

Difference

Approx. 2 %.

Frequency

Max. 1 pulse/s.

Measuring voltage

Ranges:
50.0 - 5000 Ω : 1.4 VDC
0.5 - 500 K Ω : 8.2 VDC

Pin 5 positive.
Pin 7 negative.

Measuring resistor (RM)

All types of variable resistors and diodes, e.g. photo-, thermo-, magnetic- and humidity resistors where the working range is inside the measuring range of the relay.
N.B.: Ensure correct polarity of diodes.

Reference resistor (RR)

Either the built-in potentiometer or an external resistor/potentiometer (1/4 W) are used for reference.
Alternatively, a fixed resistor with high ohmic value and a potentiometer with low ohmic value, connected in series, are used to achieve more accurate setting.

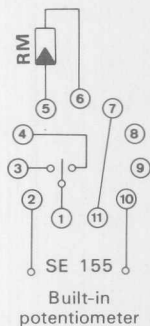
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

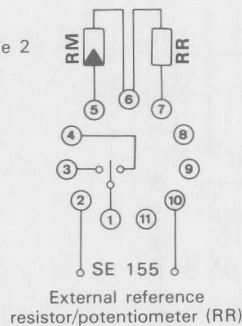
Remote potentiometer kit.
Temperature sensors, type ETS 1, ETS 2 or ETS 3.
See catalogue on accessories.

WIRING DIAGRAMS

Example 1



Example 2



MODE OF OPERATION

Example 1

When the measuring resistor (RM) and the set resistance of the built-in potentiometer (RR) are identical, the relay is in its centre position.
If RM is more than 1 % greater than RR, the relay will switch on the contact between pins 1 and 3.
If RM is more than 1 % less than RR the relay will switch on the contact between pins 1 and 4.

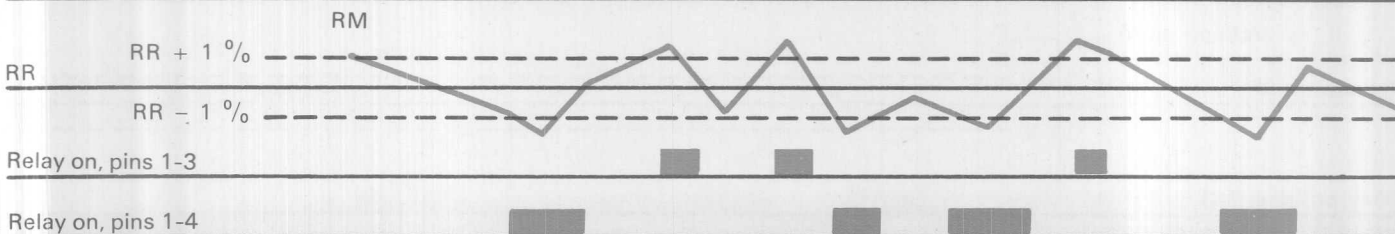
Example 2

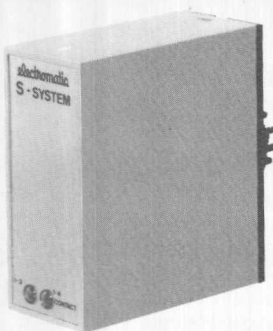
When the measuring resistor (RM) and the reference resistance (RR) are identical, the relay is in its centre position.
If RM is more than 1 % greater than RR, the relay will switch on the contact between pins 1 and 3.
If RM is more than 1 % less than RR, the relay will switch on the contact between pins 1 and 4.

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

OPERATION DIAGRAM

Supply voltage





SE 170
No adjustment

SE 170

- * Differential relay for servomechanisms.
- * Used for remote positioning in conjunction with 2 slide- or turn potentiometers.
- * Suitable in all slow-moving motor operated appliances, e.g. dentist's chairs.
- * 10 A SPDT output relay with neutral centre position.
- * LED indication of both operative relay positions.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Controlling potentiometer (P 1)

Value:
Min. 1000 Ω .
Max. 5000 Ω .

Reference potentiometer (P 2)

Value:
Min. 1000 Ω .
Max. 5000 Ω .

Hysteresis
< 1 %.

Difference
Approx. 2 %.

Measuring voltage

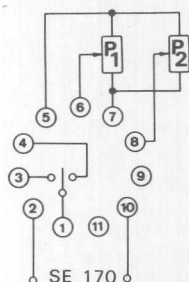
4.7 VDC.
Pin 5 positive.
Pin 7 negative.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.
Remote potentiometer kit.

S
E

WIRING DIAGRAM



MODE OF OPERATION

Differential relay intended for controlling servo-systems by 2 external potentiometers. The relay operates as a feed-back relay, i.e. if the setting of the two potentiometers is identical, the relay is in the centre position.

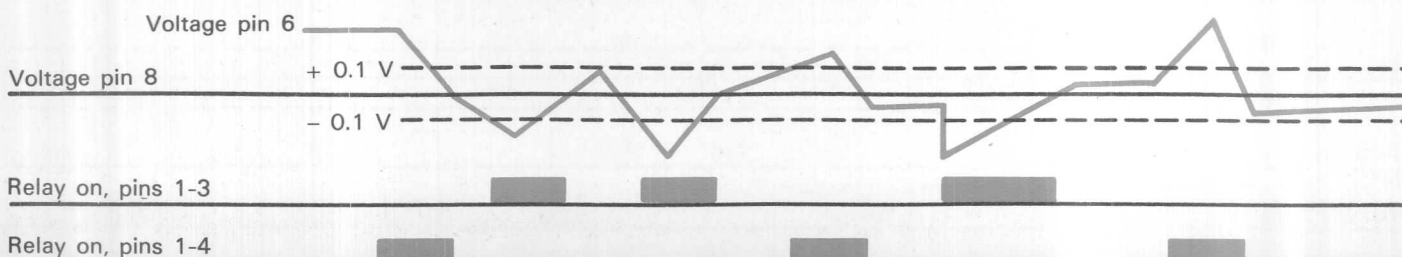
If P 1 is turned clock-wise (downwards), the relay will switch on the contact between pins 1 and 3, until P 2 is turned to the same position.

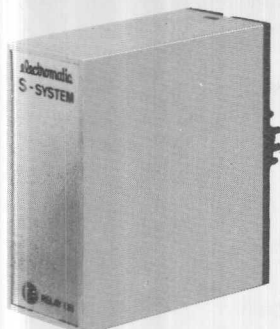
If P 1 is turned counter-clockwise (upwards), the relay will switch on the contact between pins 1 and 4, until P 2 is turned to the same position.

By interruption of the supply voltage the relay shall always return to the neutral centre-position.

OPERATION DIAGRAM

Supply voltage





SF 110
No
adjustment

SF 110

- * Frequency relay with fixed bandwidth.
- * Centre frequency: 50 Hz or 60 Hz.
- * Fixed bandwidth: 6 Hz.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC supply voltage - 50 Hz or 60 Hz.

SPECIFICATIONS

**Common technical data
and ordering key**
Pages 10-12.

Centre frequency
50 Hz \pm 0.5 Hz.
or
60 Hz \pm 0.5 Hz.

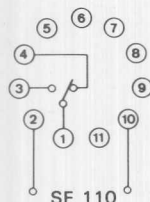
When ordering:
Please specify the centre
frequency.

Fixed bandwidth
6 Hz.

Hysteresis
< 1 % of the centre frequency.

Accessories
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAM

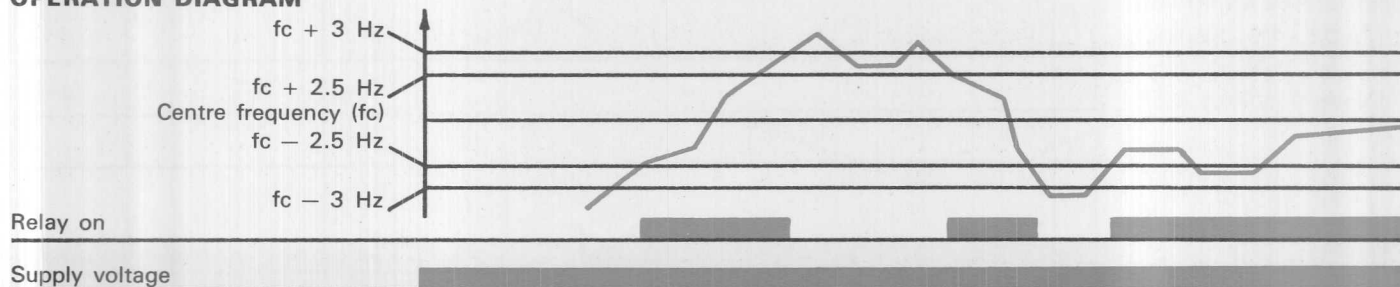


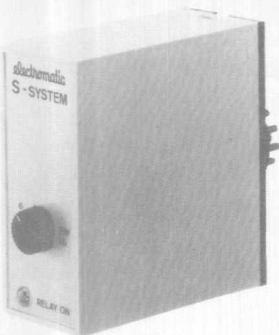
MODE OF OPERATION

The SF 110 relay checks that the frequency of the supply voltage - 50 Hz or 60 Hz nominally - is kept within a fixed tolerance. The tolerance has a value of \pm 3 Hz, which equals a fixed bandwidth of 6 Hz.

As long as the frequency of the supply voltage is kept within the limits, thus f. inst. 47 Hz - 53 Hz \pm 0.5 Hz, the relay will be in the operating position, otherwise it will be in the released position. When ordering: Please specify the centre frequency.

OPERATION DIAGRAM





SF 125
Knob-adjustable

SF 125

- * Frequency relay with adjustable bandwidth.
- * Centre frequency: 50 Hz or 60 Hz.
- * Bandwidths: 1, 3, 5 Hz
or
2, 4, 6 Hz.
- * Adjustment of the bandwidth by built-in rotary switch.
- * Quartz-controlled digital circuit.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC supply voltage - 50 Hz or 60 Hz.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Centre frequency
50 Hz \pm 0.01 Hz
or
60 Hz \pm 0.01 Hz.

Bandwidths
2 types:
1, 3, 5 Hz
or
2, 4, 6 Hz.

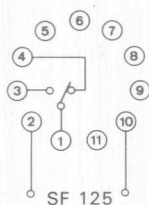
When ordering:
Please specify the centre frequency and the bandwidth.

Adjustment
The bandwidth is set by a built-in rotary switch.

Sampling time
T = 1 second.

Accessories
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAM



MODE OF OPERATION

The SF 125 relay checks that the frequency of the supply voltage - 50 Hz or 60 Hz nominally - is kept within certain pre-selected tolerances.

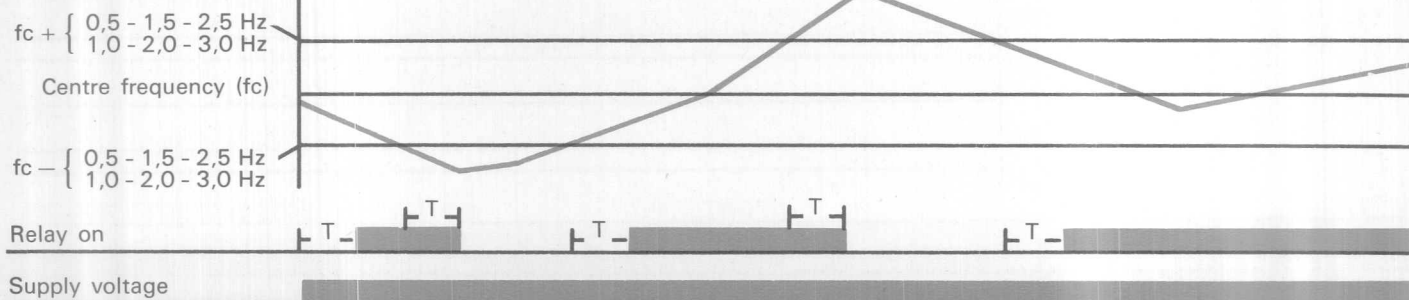
The bandwidth, which is selected on a rotary switch in the front of the relay, is 1, 3, 5 or 2, 4, 6 Hz, which equals a tolerance of \pm 0.5 Hz, \pm 1 Hz, \pm 1.5 Hz, \pm 2 Hz, \pm 2.5 Hz and \pm 3 Hz.

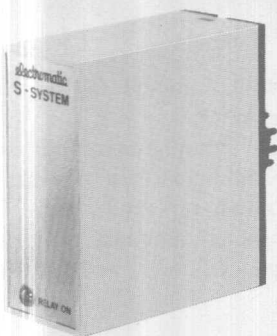
As long as the frequency of the supply voltage is kept within the limits, thus f. inst. 49 Hz - 51 Hz \pm 0.01 Hz, the relay will be in the operating position, otherwise it will be in the released position.

The relay responds within 1 second.

When ordering:
Please specify the centre frequency and the bandwidth.

OPERATION DIAGRAM





SF 140
No. adjustment

SF 140

- * Digital controller for windmills with 4-pole*) asynchronous motor-generators.
- * Compares in short intervals the actual frequency of the magnetizing voltage (the mains) and the actual speed of the motorgenerator.
- * Connects/disconnects without commuting generator/mains in dependance of all relevant parameters.
- * 10 A SPDT output relay.
- * LED indication for relay on.

SPECIFICATIONS

Common technical data and ordering key Pages 10-12.

Measuring input, mains frequency

Pins 2 and 10 which are also power input for the S-SYSTEM. Note that the voltage connected to pins 2 and 10 must originate from the same AC-source as used for magnetizing the motor-generator. The S-SYSTEM is applicable for all frequencies between 45 and 65 Hz.

Measuring input, generator speed

Pins 6 and 7.
Measuring voltage: 8 VDC.
Pin 6 positive.
Short-circuit current: 20 mA.
Use inductive proximity sensors type DU or DJ or capacitive sensors type DR, to pick up the number of generator shaft revolutions. See drawing below for minimum size of segment. Connection cable, screened, length as desired, resistance, however, max. 100 Ω . Screen to be connected to the frame of the windmill.

Sampling time

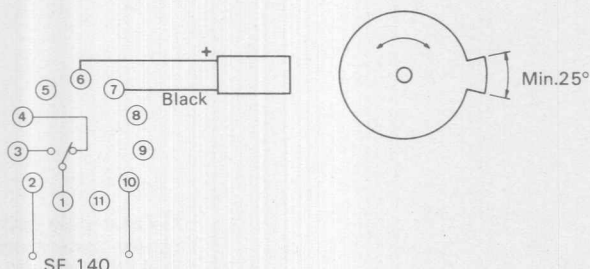
Once per generator-shaft revolution, equalling max. 40 ms at 1500 r.p.m., respectively max. 33,33 ms at 1800 r.p.m. (Synchronous speeds at 50/60 Hz).

Accessories

Bases.
Hold down spring.
Base covers.
Mounting rack.
Front mounting bezel.

Inductive or capacitive proximity sensors, type DU, DJ or DR.
See catalogue on accessories.

WIRING DIAGRAM



*) For 6-pole asynchronous motor-generators, use S-SYSTEM type SF 160.

MODE OF OPERATION

The SF 140 measures and compares digitaly the two parameters being of significant relevance in windmill electricity generation, thus:

- The actual **speed**, as determined by the velocity of the wind, of an asynchronous motor-generator.
- The actual **frequency** (45-65 Hz) of the alternating current used to magnetize the motor-generator.

The **speed** of the motor-generator is sensed by an inductive or capacitive proximity sensor, scanning a segment fixed on the shaft of the motor-generator. The **frequency** is sensed on the basis of the AC supply voltage powering the S-system (and magnetizing the motor-generator).

The contact of the built-in relay is supposed to operate an external contactor which in turn switches the connection between the motor-generator and the mains »ON« and »OFF«.

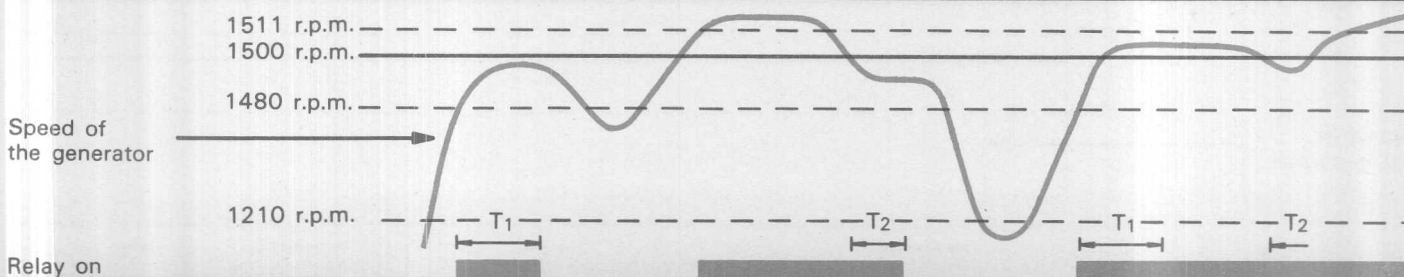
Switching mode

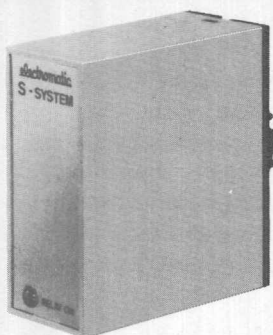
When the speed of the motor-generator during acceleration for the first time in a cycle, exceeds 1480 r.p.m. (at 50,00 Hz), the relay operates. Provided that the speed within app. 5 seconds (T₁) increases to at least 1500 r.p.m., the relay remains in its operating position. When not, it releases. Decreasing speed is sensed when 1500 r.p.m. is surpassed, and a time circuit is activated. If the speed within app. 2 se-

conds (T₂) again goes up and reaches at least 1500 r.p.m. the relay remains in operating position. If not, it releases. When the relay is released and the speed of the motor-generator has dropped to a value between 1210 and 1500 r.p.m., the relay shall not operate again until the speed after a new acceleration exceeds 1511 r.p.m. If the speed, however, drops to a value below 1210 r.p.m., a new cycle begins which means, that the relay operates already at 1480 r.p.m., and the complete switching cycle described earlier is repeated. The SF 140 contains a number of auxiliary circuits, which help to prevent mechanical overload in case of unusual operational conditions.

OPERATION DIAGRAM

Supply voltage





SF 160
No adjustment

SF 160

- * Digital controller for windmills with 6-pole*) asynchronous motor-generators.
- * Compares in short intervals the actual frequency of the magnetizing voltage (the mains) and the actual speed of the motorgenerator.
- * Connects/disconnects without commuting generator/mains in dependance of all relevant parameters.
- * 10 A SPDT output relay.
- * LED indication for relay on.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Measuring input, mains frequency

Pins 2 and 10 which are also power input for the S-SYSTEM. Note that the voltage connected to pins 2 and 10 must originate from the same AC-source as used for magnetizing the motor-generator. The S-SYSTEM is applicable for all frequencies between 45 and 65 Hz.

Measuring input, generator speed

Pins 6 and 7.
Measuring voltage: 8 VDC.
Pin 6 positive.
Short-circuit current: 20 mA.
Use inductive proximity sensors type DU or DJ or capacitive sensors type DR, to pick up the number of generator shaft revolutions. See drawing below for minimum size of segment. Connection cable, screened, length as desired, resistance, however, max. 100 Ω . Screen to be connected to the frame of the windmill.

Sampling time

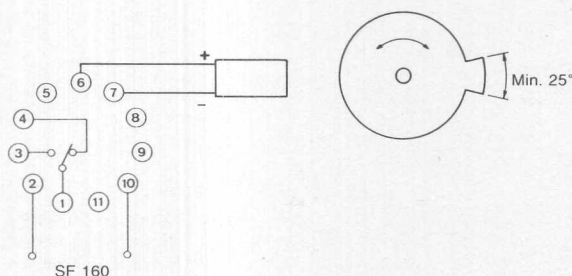
Once per generator-shaft revolution, equalling max. 60 ms at 1000 r.p.m., respectively max. 50 ms at 1200 r.p.m. (Synchronous speeds at 50/60 Hz).

Accessories

Bases.
Hold down spring.
Base covers.
Mounting rack.
Front mounting bezel.

Inductive or capacitive proximity sensors, type DU, DJ or DR.
See catalogue on accessories.

WIRING DIAGRAM



*) For 4-pole asynchronous motor-generators, use S-SYSTEM type SF 140.

MODE OF OPERATION

The SF 160 measures and compares digitally the two parameters being of significant relevance in windmill electricity generation, thus:

- The actual **speed**, as determined by the velocity of the wind, of an asynchronous motor-generator.
- The actual **frequency** (45-65 Hz) of the alternating current used to magnetize the motor-generator.

The **speed** of the motor-generator is sensed by an inductive or capacitive proximity sensor, scanning a segment fixed on the shaft of the motor-generator. The **frequency** is sensed on the basis of the AC supply voltage powering the S-system (and magnetizing the motor-generator).

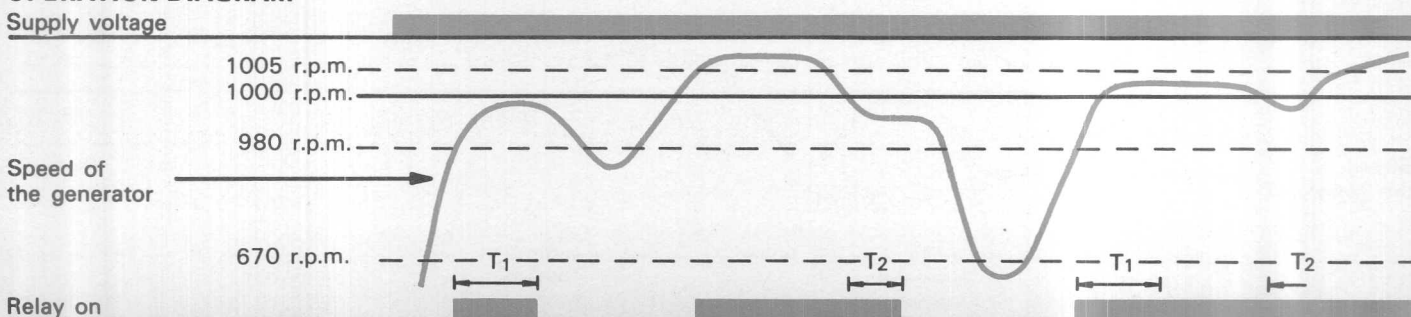
The contact of the built-in relay is supposed to operate an external contactor which in turn switches the connection between the motor-generator and the mains »ON« and »OFF«.

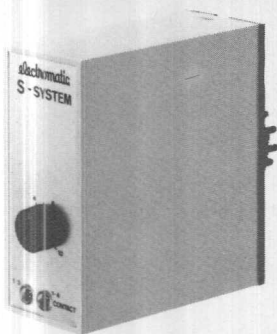
Switching mode

When the speed of the motor-generator during acceleration for the first time in a cycle, exceeds 980 r.p.m. (at 50,00 Hz), the relay operates. Provided that the speed within app. 5 seconds (T₁) increases to at least 1000 r.p.m., the relay remains in its operating position. When not, it releases. Decreasing speed is sensed when 1000 r.p.m. is surpassed, and a time circuit is activated. If the speed within app. 2 se-

conds (T₂) again goes up and reaches at least 1000 r.p.m. the relay remains in operating position. If not, it releases. When the relay is released and the speed of the motor-generator has dropped to a value between 670 and 1000 r.p.m., the relay shall not operate again until the speed after a new acceleration exceeds 1005 r.p.m. If the speed, however, drops to a value below 670 r.p.m., a new cycle begins which means, that the relay operates already at 980 r.p.m., and the complete switching cycle described earlier is repeated. The SF 160 contains a number of auxiliary circuits, which help to prevent mechanical overload in case of unusual operational conditions.

OPERATION DIAGRAM





SG 125
Knob-adjustable

SG 125

- * Two state relay with built-in memory.
- * Controlled by own supply voltage.
- * Switches, with a preset delay, to opposite contact position at supply voltage interruption.
- * Contact position, however, remains unchanged when supply voltage is applied.
- * Knob-adjustable delay: 0.15 - 3 seconds.
- * 5 A SPDT output relay.
- * LED-indication of both relay positions as long as the supply voltage is on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Time range
0.15-3 s.

Knob-adjustable on relative scale.

Duration of connection

Minimum duration of connection of supply voltage for proper operation: 1 s.

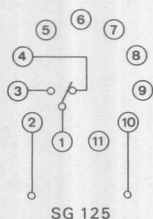
Duration of interruption

In order to make the output relay switch, the duration of the interruption of the supply voltage must exceed the delay set on the potentiometer.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAM

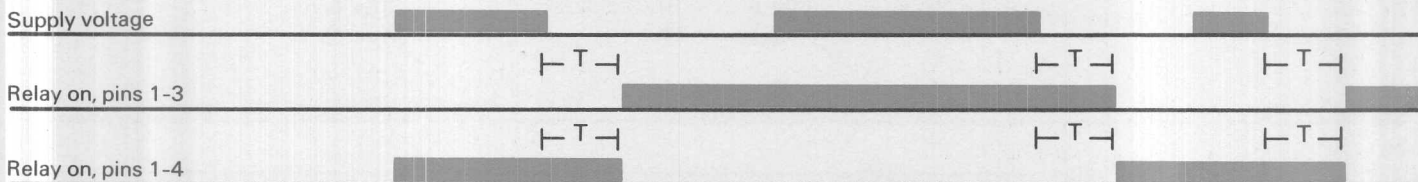


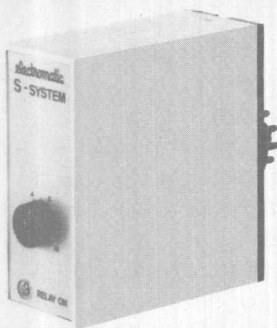
MODE OF OPERATION

The relay contact remains in its present position (pins 1-4 or pins 1-3) when supply voltage is applied. At interruption of the supply voltage, however, the contact switches after a set delay (0.15-3 s), to the opposite position, where it remains.

The SG 125 S-system is primarily used where for instance 2 pumps must be running alternating, each during a period between a supply voltage connection and a supply voltage interruption.

OPERATION DIAGRAM





SG 195
Knob-adjustable

SG 195

- * AC current metering/current direction relay.
- * Range: 0.1-500 A in conjunction with current metering transformers MI 5-MI 500.
- * Knob-adjustable to desired current level.
- * Signal output for feeding up to 5 current metering relays type SM 115.
- * Output signal is only present at selected current direction.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Hysteresis
App. 10 % of set value.

Input for current metering transformer

Pins 5 and 7. Voltage from the current metering transformer 0.1-4.0 VAC_{peak} (max. 20 VAC_{rms}).
Cos φ in the phase measured on: 0.5-1.0. Polarisation of the conductors from the current metering transformer to pins 5 and 7 is decisive for, in which of the two current directions the relay is energized at set current level.

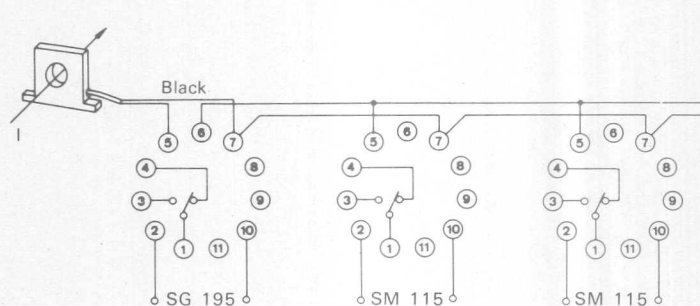
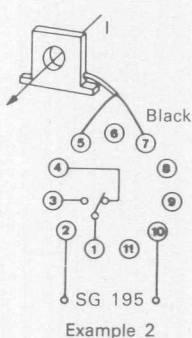
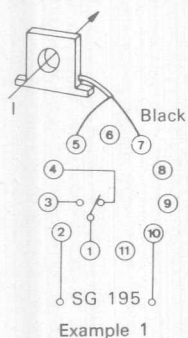
Output for feeding type SM 115 current metering relays

Pins 6 and 7. Same voltage as delivered by the current metering transformer to pins 5 and 7 of the SG 195 relay.
Output signal is only present by selected current direction. It is possible to feed up to 5 current metering relays type SM 115, whereby the signal inputs (pins 5 and 7) of the relays must be coupled in parallel. See wiring diagrams below.

Accessories

Current metering transformers type MI 5, MI 20, MI 100 or MI 500.
The current metering transformers specified deliver a voltage, ranging from 0.1 to 4.0 VAC_{peak}, and is proportional with the current in the conductor measured on.
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.
See catalogue on accessories.

WIRING DIAGRAMS



MODE OF OPERATION

The S-system type SG 195 is a combined current metering and current direction relay.

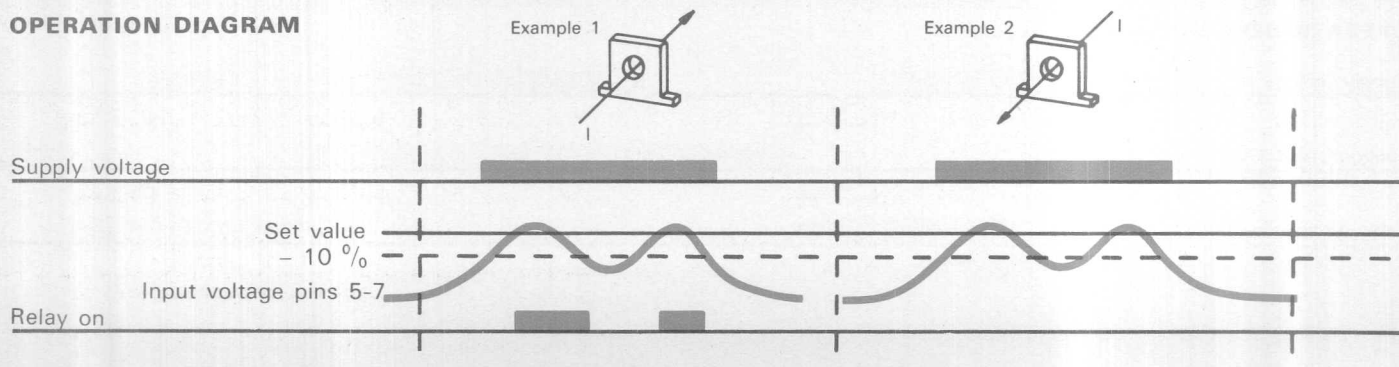
When the current, in the phase conductor on which is measured, flows in the preselected direction, and it exceeds the set current level, the relay is energized.

When the current drops to 90 % of the set value (10 % hysteresis) and/or the direction of the flow of current changes (example 2), the relay releases.
The S-system SG 195 is equipped with a signal output for feeding up to five current metering relays SM 115.

It is thus possible, with the S-systems mentioned, and only one current metering transformer, to arrange a step-by-step switching of loads at up to 6 different current levels. Output signal from the SG 195 is of course only present, when the direction of current flow is the preselected.

Please remark, that the SG 195 S-system must be powered from the same phase on which the current is metered, and that the cos φ of the load must be between 0.5 and 1.0.

OPERATION DIAGRAM





SG 237
Built-in potentiometer
and rotary switch

SG 237

- * Start attempt/alarm-relay for combustion engines (generator sets) with automatic start-up.
- * Number of start attempts (1-6) is preselected on upper knob, duration of the attempts is set on lower knob.
- * Separate 10 A SPDT-contact for repeated actuation of motorstarter-relay.
- * Separate 10 A SPDT-contact for alarm-actuation after conclusion of the preselected number of start attempts.
- * LED indication for ON position of both relays.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15- 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s

Range accuracy

+ 5 % on max.
- 10 % on min.

Repeatability

± 0.1 %.

Max. time variation

± 1 % in the temperature range
- 20°C to + 60°C.
(- 4°F to + 140°F).

Reset of time

By interruption of the supply voltage for min. 100 ms.

Time adjustment

On lower knob. Pulse/pause periods are equal.

Number of start attempts

1-6 on upper knob.

DC supply voltage

The standard version (SG 237712) operates directly on 12 VDC, which is connected to pins 2 and 10. Pin 10 negative. The same relay can be supplied by 24 VDC when positive is connected to pin 6 via a resistor (100 Ω, 1 W).

Consumption:
At 12 VDC: Max. 2 W.
At 24 VDC: Max. 3 W.
Permissible voltage fluctuations:
+ 20 %/- 25 %.

AC supply voltage

Besides emergency generating sets other applications for the SG 237 relay can be imagined. Therefore the relay is also made for AC-standard supply voltages.

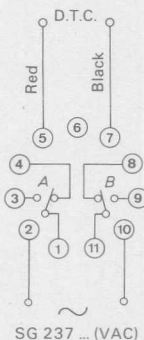
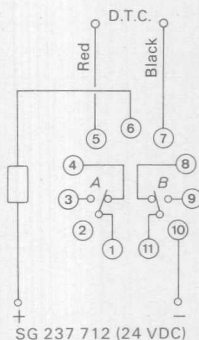
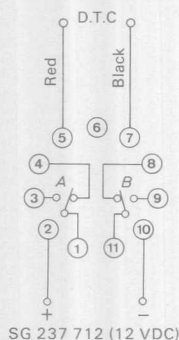
Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

Digital Timer Control

Connection for Digital Timer Control (D.T.C.) between pins 5 and 7.
Pin 5 positive.

WIRING DIAGRAMS



MODE OF OPERATION

This S-System is most commonly used in generator sets where a combustion engine is started automatically, possibly requiring several (1-6) start attempts, and where an alarm is required if the last start attempt fails.

The supply voltage is connected. After the set time (f.inst. 3 s) has elapsed, relay »A« is energized. After further 3 seconds relay »A« is deenergized.

This cycling is completed from 1 to 6 times as set on the upper knob, or until the supply voltage is interrupted. Relay »A« now remains deenergized. After conclusion of the set number of start-attempts (f.inst. 2), relay »B« is energized. Relay »B« remains energized until the supply voltage is interrupted.

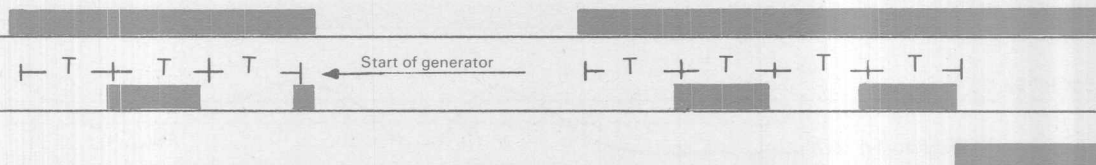
OPERATION DIAGRAM

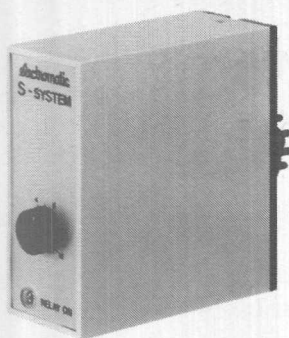
Preset start attempts: 2

Supply voltage

Relay on, pins 1-3

Relay on, pins 9-11





SH 115
Knob-adjustable

SH 115

- * Relay for the detection of gases.
- * For use in conjunction with gas detector, type HG 10 or HG 20.
- * Knob-adjustable trip point.
- * Inversion of relay function possible.
- * Fail safe on cable break.
- * Connection for moving-coil instrument.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Adjustment

The activating level is adjustable by built-in potentiometer.

Hysteresis

Approx. 10%.

Initial operation

Duration of connection of supply voltage for proper operation: 3 minutes.

(Final adjustment should be made after a week, if the detector, type HG 10 or HG 20, has been unenergized for more than a month).

Gas detectors

SH 115 is used in conjunction with gas detector, type HG 10 or HG 20.

The sensitivity of the detector is only slightly altered within the following limits:

Ambient temperature:

-10 to +35°C.

(14 to 95°F).

Relative humidity:

30 to 100%.

Voltage output

Pins 5 and 7: 5 VDC.

Pin 5 positive.

Measuring input

Pins 6 and 7: 5 VDC.

Pin 6 positive.

Instrument connection

Maximum 2.5 V is generated over pins 8 and 11 (pin 11 positive) across an internal resistance of 1.6 kΩ.

Connection for moving-coil instrument with 1 mA full scale deflection and neutral centre position. Internal resistance 300Ω.

The instrument shows relative gas level, and centre position equals the level set on the built-in potentiometer of the SH 115.

Accessories

Bases.

Hold down spring.

Mounting rack.

Base covers.

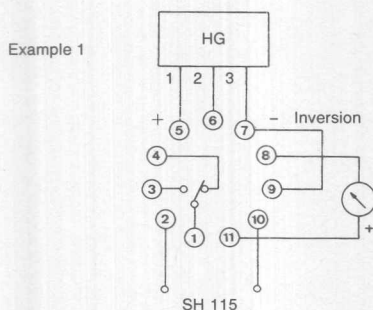
Front mounting bezel.

Instrument, type IDM 270.

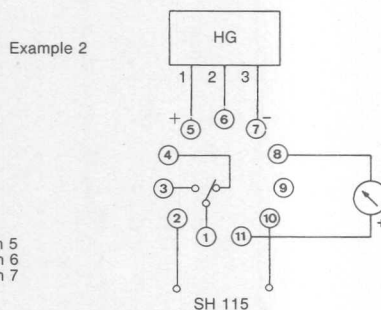
Gas detector, type HG 10 or HG 20.

See catalogue on accessories.

WIRING DIAGRAMS



SH 115



Terminal 1: Pin 5
Terminal 2: Pin 6
Terminal 3: Pin 7

SH 115

MODE OF OPERATION

S-system type SH 115 is used with gas detector, type HG 10 or HG 20.

These two types differ in their relative sensitivities to different gases (see under HG 10/ HG 20 in catalogue on accessories).

At connection of the supply voltage, the detector needs an initial operation time before proper detection is achieved (see above).

SH 115 has a built-in potentiometer, and in determining the right detector type and trip point, the following factors should be considered:

Purpose of detection (e.g. gas leak), type of gas being monitored, placing of detector, operation of S-system (e.g. siren).

At the detection of light gases, the detector should be placed high up and vice versa. Draught should be avoided.

Example 1

The relay operates, when the registered gas level exceeds the set level, and releases when it drops below the set level minus 10% (hysteresis). A moving-coil instrument can be connected for indication of the relative gas level.

Example 2

The relay operates, when the registered gas level drops below the set level minus 10% (hysteresis), and releases, when the registered level reaches the set level.

The relay operates at cable breaking. A moving-coil instrument can be connected for indication of the relative gas level.

OPERATION DIAGRAM

Supply voltage

Set level

-10%

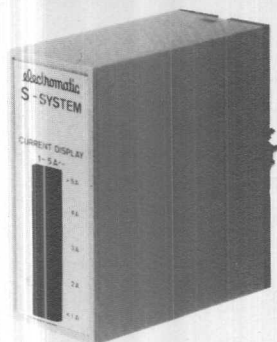
Registered level

Example 1: Relay on

Example 2: Relay on

SJ 053

- * Analogue panel indicator for AC current metering.
- * Measuring range: 0.2 mA to 5 AAC, divided into 6 sub-ranges.
- * The r.m.s. value of a sinusoidal current can be read on the columnar LED display.
- * Resolution: 6.25% of the delta range.
- * Can be used in conjunction with current metering relay type SJ 155.
- * No setting possible. No output relay.
- * AC or DC supply voltage.



SJ 053
No adjustment

SPECIFICATIONS

Common technical data and ordering key Pages 10-12.

Ranges of measurement

Scale ranges	Internal resistance	Max. current
0.2- 1 mA	100 Ω	10 mA
4 - 20 mA	5.1 Ω	100 mA
20 -100 mA	1.0 Ω	500 mA
100 -500 mA	0.2 Ω	2 A
0.4- 2 A	0.05 Ω	6 A
1 - 5 A	0.02 Ω	10 A

The scale range equals the r.m.s.value of a sinusoidal current.

Display

Columnar display consisting of 16 light-emitting diodes (LED).

Resolution per diode

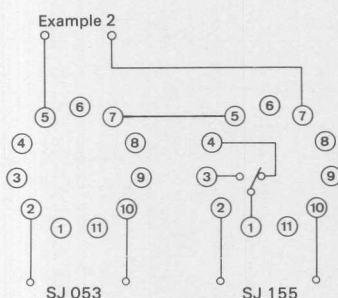
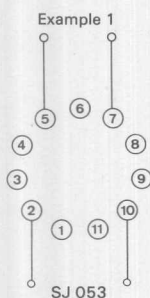
6.25% of the delta range (scale range).

Example: Scale range 4 to 20 mA, delta range 20 minus 4 mA = 16 mA, resolution 6.25% of 16 mA = 1.0 mA.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

WIRING DIAGRAMS



MODE OF OPERATION

Analogue panel indicator for AC current metering, where the r.m.s. value of a sinusoidal current can be read on the columnar LED display consisting of 16 diodes.

6 ranges of measurement from 0.2 mA to 5 AAC. The resolution per diode is 6.25% of the delta range (scale range).

The indicator is connected in series with the load (pins 5 and 7), and needs separate power supply (pins 2 and 10).

Upper and lower limits of the scale range are shown > and < respectively. If the measured value is outside the range of measurement of the indicator, either the upper or the lower diode is lit.

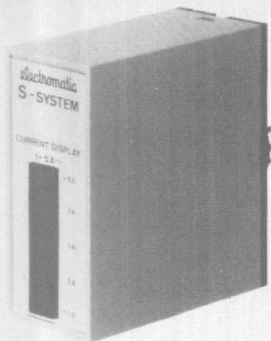
Example 1

The measured alternating current is shown on the columnar LED display of the indicator.

Example 2

The measuring current is connected both to indicator type SJ 053 and current metering relay type SJ 155.

The indicator shows the value of the measured alternating current on the display, and the current metering relay operates, when the measured current reaches the value set on the relay.



SJ 073
No adjustment

SJ 073

- * Analogue panel indicator for AC current metering.
- * Measuring range: 10 to 200 AAC, divided into 12 sub-ranges in conjunction with through-primary current metering transformer type CT3A.
- * The r.m.s. value of a sinusoidal current can be read on the columnar LED display.
- * Resolution: 6.25% of the delta range.
- * Can be used in conjunction with current metering relay type SJ 175.
- * No setting possible. No output relay.
- * AC or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Display

Columnar display consisting of 16 light-emitting diodes (LED).

Resolution per diode

6.25% of the delta range (scale range).

Example: Scale range 12 to 60 AAC, delta range 60 minus 12 AAC = 48 AAC, resolution 6.25% of 48 AAC = 3.0 AAC.

Ranges of measurement

Metering range (secondary current)	Matching current transformer type	Scale range of the indicator (primary current)	Internal resistance of the indicator	Maximum current
0.2 - 1 AAC	CT3A-1050	10 - 50 AAC	0.1 Ω	2 AAC
0.2 - 1 AAC	CT3A-1060	12 - 60 AAC	0.1 Ω	2 AAC
0.2 - 1 AAC	CT3A-1075	15 - 75 AAC	0.1 Ω	2 AAC
0.2 - 1 AAC	CT3A-1100	20 - 100 AAC	0.1 Ω	2 AAC
0.2 - 1 AAC	CT3A-1150	30 - 150 AAC	0.1 Ω	2 AAC
0.2 - 1 AAC	CT3A-1200	40 - 200 AAC	0.1 Ω	2 AAC
1 - 5 AAC	CT3A-5050	10 - 50 AAC	0.02 Ω	10 AAC
1 - 5 AAC	CT3A-5060	12 - 60 AAC	0.02 Ω	10 AAC
1 - 5 AAC	CT3A-5075	15 - 75 AAC	0.02 Ω	10 AAC
1 - 5 AAC	CT3A-5100	20 - 100 AAC	0.02 Ω	10 AAC
1 - 5 AAC	CT3A-5150	30 - 150 AAC	0.02 Ω	10 AAC
1 - 5 AAC	CT3A-5200	40 - 200 AAC	0.02 Ω	10 AAC

Example of ordering

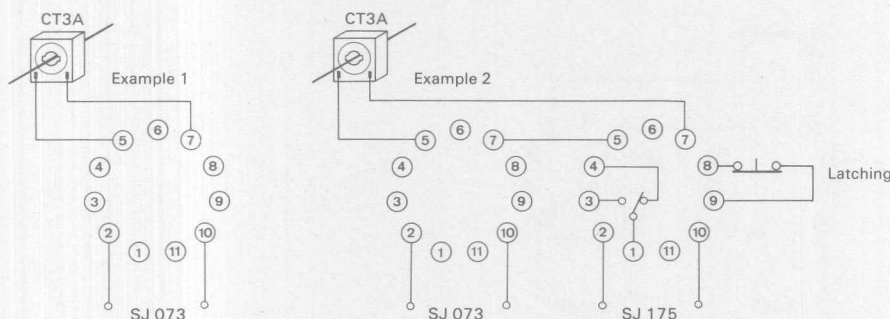
Type	Supply voltage	Max. metering range	Max. value of scale
SJ 073	220	1	100

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Through-primary current transformer type CT3A.
See catalogue on accessories.

WIRING DIAGRAMS



MODE OF OPERATION

Analogue panel indicator for AC current metering.

The r.m.s. value of a sinusoidal current can be read on the columnar LED display consisting of 16 diodes.

12 ranges of measurement from 10 to 200 AAC in conjunction with through-primary current transformer type CT3A.

Resolution per diode in the display: 6.25% of the delta range (scale range).

The indicator needs separate power supply (pins 2 and 10).

Upper and lower limits of the scale range are shown > and < respectively. If the measured value is outside the scale range of the indicator, either the upper or the lower diode is lit.

Example 1

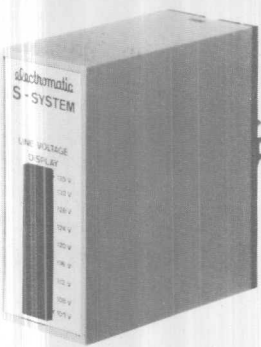
On the columnar LED display of the indicator, the value of the measured alternating current is shown.

Example 2

The wiring diagram shows indicator type SJ 073 in conjunction with current metering relay type SJ 175, here used as a current limit-

ter with latching. A kWh-meter can be connected.

The indicator shows the value of the measured alternating current on the display, and the relay operates, when the measured current reaches the set value. By this a contactor can be activated thus either interrupting the primary current wholly/partly, or short-circuiting pin 5 of the SJ 073 and pin 7 of the SJ 175. The latching is reset, when a new measurement is required, provided that the measuring current is below the set value minus the hysteresis.



SJ 093
No adjustment

SJ 093

- * Analogue panel indicator for AC voltage metering.
- * Measuring range: 20 – 255 VAC.
- * Measures on its own supply voltage.
- * The r.m.s. value of a sinusoidal voltage can be read on the columnar LED display.
- * Resolution: 0.5 to 5 VAC.
- * Can be used in conjunction with voltage metering relay type SJ 195 or SJJ 195.
- * No setting possible. No output relay.
- * AC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10–12.

Display
Columnar display consisting of 16 light-emitting diodes (LED).

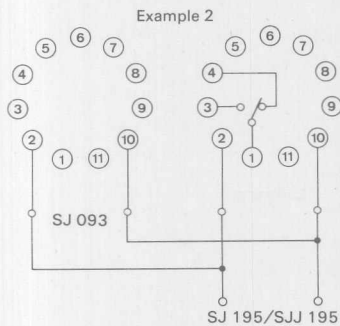
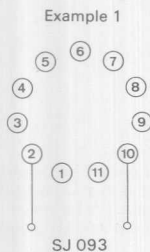
Accessories
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Ranges and resolution

Type	Measuring range	Working range	Resolution per diode
SJ 093 024	20– 28 VAC	19– 29 VAC	0.5 VAC
SJ 093 120	105–135 VAC	100–140 VAC	2 VAC
SJ 093 220	185–255 VAC	180–260 VAC	5 VAC

The range equals the r.m.s. value of a sinusoidal voltage.
The measuring/supply voltage should be inside the working range.

WIRING DIAGRAMS



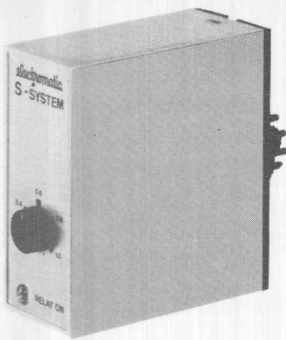
MODE OF OPERATION

Analogue panel indicator for alternating voltage metering.
Measures on own supply voltage, and the r.m.s. value of a sinusoidal voltage can be read on the columnar LED display consisting of 16 diodes.
3 measuring ranges from 20 to 255 VAC, and a resolution of 0.5 to 5 VAC.
Upper and lower limits of the scale are shown > and < respectively.

If the measured voltage is inside the working range but outside the measuring range, either the top or the bottom diode is lit.

Example 1
The value of the measured supply voltage is shown on the columnar LED display of the indicator.

Example 2
The measuring/supply voltage is connected both to indicator type SJ 093 and voltage metering relay type SJ 195 or SJJ 195. The indicator shows the value of the measured alternating voltage on the display, and the voltage metering relay operates, when the measured voltage reaches the value set on the relay.



SJ 105
Knob-adjustable

SJ 105

- * DC current metering relay with absolute mA-scale and internal shunt.
- * Metering range: 0.2 mA - 5 A, divided into 6 sub-ranges.
- * Knob-adjustable trip point.
- * Latching at set level possible.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Metering ranges

Scale ranges	Internal shunt	Max. current
0.2 - 1 mA	100 Ω	10 mA
4 - 20 mA	5.1 Ω	100 mA
20 - 100 mA	1.0 Ω	500 mA
100 - 500 mA	0.2 Ω	2 A
0.4 - 2 A	0.05 Ω	6 A
1 - 5 A	0.02 Ω	10 A

Hysteresis

App. 10 %.
The hysteresis can be extended to app. 75 % by connecting a suitable resistor between pins 8 and 9. Resistor limits are 470 K Ω /3 K Ω (0.25 W). The hysteresis will increase by decreasing resistance.

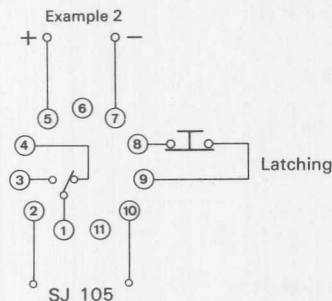
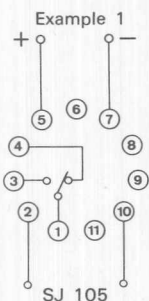
Latching

By interconnecting pins 8 and 9 the relay will latch at set level until either the supply voltage or the interconnection is interrupted.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



Note:
Internal connection between pins 7 and 10 at DC supply. No current is to be drawn through this internal connection.

MODE OF OPERATION

Example 1

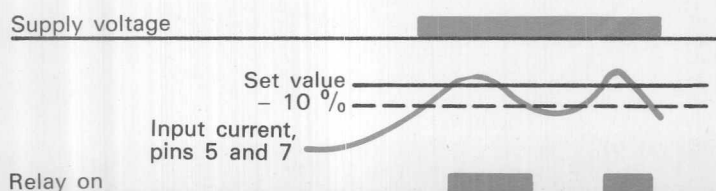
DC CURRENT METERING.
When the measured current equals the set value the relay will operate. The relay releases when the current drops min. 10 % below the set value (see hysteresis), or when the supply voltage is interrupted.

Example 2

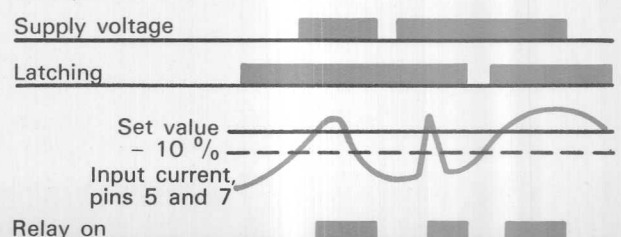
DC CURRENT METERING. LATCHING.
The relay will operate and remain in operating position when the actual current equals the set value. Provided that the current has dropped min. 10 % below the set value, the relay will release by interrupting the interconnection between pins 8 and 9. The relay also releases when the supply voltage is disconnected.

OPERATION DIAGRAMS

Example 1



Example 2





SJ 115
Knob-adjustable

SJ 115

- * DC current metering relay with absolute mV-scale for use with external standard shunt.
- * Metering range: 10 - 150 mV, divided into 4 sub-ranges.
- * Knob-adjustable trip point.
- * Latching at set level possible.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Metering ranges

Scale ranges	Internal resistance	Max. voltage
10- 50 mV	3 Ω	1 V
12- 60 mV	3 Ω	1 V
20-100 mV	7.5 Ω	2 V
30-150 mV	7.5 Ω	2 V

Hysteresis

App. 10 %.

The hysteresis can be extended to app. 75% by connecting a suitable resistor between pins 8 and 9.

Resistor limits are 470 K Ω / 3 K Ω (0.25 W).

The hysteresis will increase by decreasing resistance.

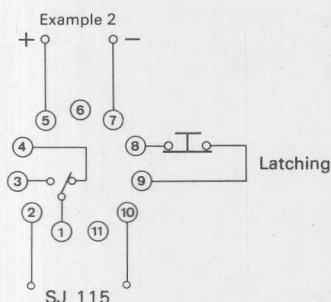
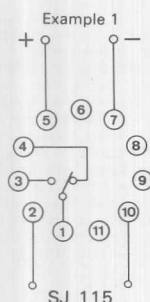
Latching

By interconnecting pins 8 and 9 the relay will latch at set level until either the supply voltage or the interconnection is interrupted.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.
External standard shunt.

WIRING DIAGRAMS



Note:
Internal connection between pins 7 and 10 at DC supply. No current is to be drawn through this internal connection.

MODE OF OPERATION

Example 1

DC CURRENT METERING.

In conjunction with external standard shunt. When the measured current equals the set value of equivalent mV the relay will operate. The relay releases when the current (voltage) drops min. 10 % below the set value (see hysteresis), or when the supply voltage is disconnected.

Example 2

DC CURRENT METERING. LATCHING.

In conjunction with external standard shunt.

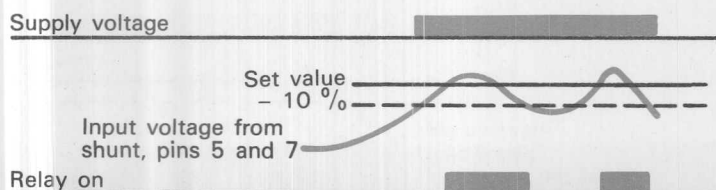
The relay will operate and remain in operating position when the measured current equals the set value of equivalent mV.

Provided that the current (voltage) has dropped min. 10 % below the set value, the relay will release when the interconnection between pins 8 and 9 is interrupted.

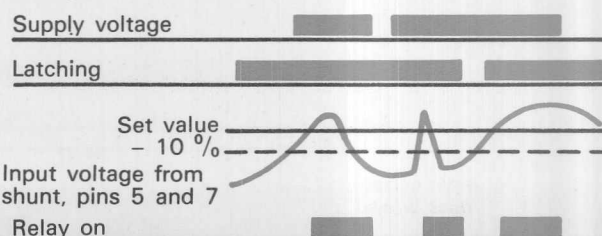
The relay also releases when the supply voltage is disconnected.

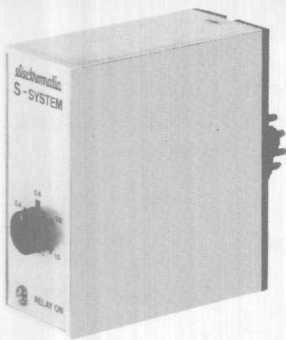
OPERATION DIAGRAMS

Example 1



Example 2





SJ 125
Knob-adjustable

SJ 125

- * DC current metering relay 0-20 mA.
- * Applicable in conjunction with DC current metering transformers up to 500 ADC and pressure transducers up to 30 psi (2.0 bar).
- * Knob-adjustable trip point.
- * Latching at set level possible.
- * 10 A SPDT output relay.
- * LED indication for relay on.
- * AC or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key Pages 10-12.

Hysteresis

App. 10%. The hysteresis can be extended to app. 75% by connecting a suitable resistor between pins 8 and 9. Resistor limits are 220 K Ω /10 K Ω (0.25 W). The hysteresis will increase by decreasing resistance.

Scale range 0-20 mA DC.

Current/pressure metering ranges

Transformer Type	Current range 1)	Pressure transducer type	Pressure range	Equivalent scale ranges
JD 20	2- 20 ADC	JP 05	0- 5 psi (0-0.3 bar)	0-20 mA
JD 100	10-100 ADC	JP 15	0-15 psi (0-1.0 bar)	0-20 mA
JD 500	50-500 ADC	JP 30	0-30 psi (0-2.0 bar)	0-20 mA

Idle voltage

Pin 5: + 25 VDC
Pin 6: + 18 VDC
Pin 7: Negative

Short-circuit current

Pin 5: Max. 2.5 A
Pin 6: Max. 40 mA
Pin 7: Negative.

Connection cable

Moulded grey PVC cable.
JD: $3 \times 0.14 \text{ mm}^2$, $\varnothing 4 \text{ mm}$.
JP: $3 \times 0.4 \text{ mm}^2$, $\varnothing 4.5 \text{ mm}$.
Length: 2 metres. Can be extended if necessary. Red core (+) is connected to pin 5, yellow core (signal) to pin 6 and black (-) to pin 7.

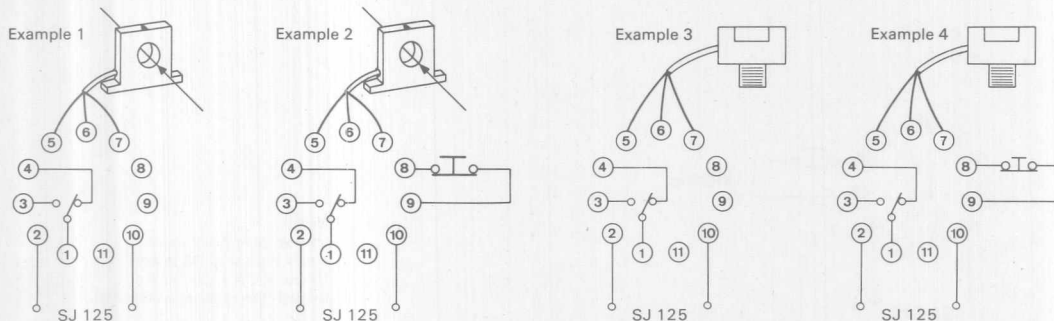
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

DC current metering transformers, type JD.
Pressure transducers, type JP.
See catalogue on accessories.

SJ

WIRING DIAGRAMS



1) The conductor on which you meter is drawn through the central hole of the current metering transformer. It is possible to meter currents below the nominal range by drawing the conductor through the hole more times. If the conductor is drawn through the central hole for instance 5 times, the metering transformer will register 5 A when the current in the conductor is 1 A. In any case, the direction of the current must match the direction indicated by an arrow on the current metering transformer.

MODE OF OPERATION

Example 1.

DC CURRENT METERING

In conjunction with a DC current metering transformer, type JD. The relay will operate when the current equals the set value. The relay will release when the current has again dropped min. 10% below the set value (see hysteresis), or when the supply voltage is disconnected.

Example 2

DC CURRENT METERING. LATCHING

In conjunction with a DC current metering transformer, type JD. The relay will operate and remain in operating position when the current equals the set value. Provided that the current has dropped min. 10% below the set value (see hysteresis) the relay will release when the interconnection between pins 8 and 9 is interrupted. The relay also releases when the supply voltage is disconnected.

Example 3

PRESSURE METERING

In conjunction with a pressure transducer, type JP. The relay will operate when the current through the transducer equals the set value. For further operational details see example 1.

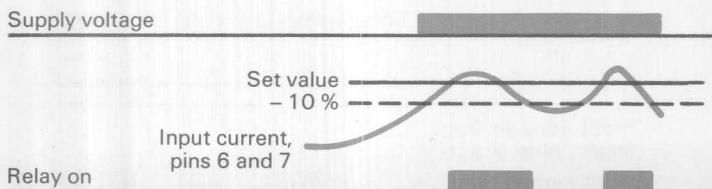
Example 4

PRESSURE METERING. LATCHING.

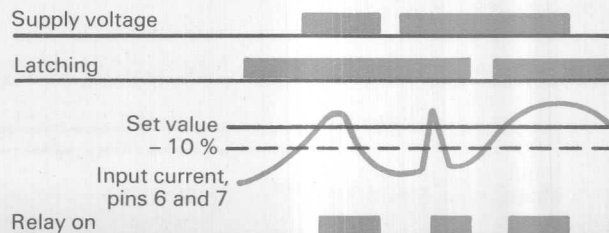
In conjunction with a pressure transducer, type JP. The relay will operate and remain in operating position when the current through the transducer equals the set value. For further operational details see example 2.

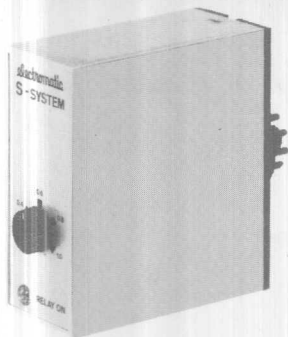
OPERATION DIAGRAMS

Examples 1 and 3



Examples 2 and 4





SJ 135
Knob-adjustable

SJ 135

- * DC voltage metering relay with absolute scale.
- * Metering range: 12 mV - 500 VDC, divided into 9 sub-ranges.
- * Knob-adjustable trip point.
- * Latching at set level possible.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Metering ranges

Scale ranges	Internal resistance	Max. voltage
12 - 60 mV	100 Ω	1 V
30 - 150 mV	150 Ω	2 V
0.2 - 1 V	1 K Ω	10 V
1 - 5 V	3 K Ω	30 V
2 - 10 V	10 K Ω	50 V
4 - 20 V	20 K Ω	100 V
10 - 50 V	51 K Ω	150 V
30 - 150 V	150 K Ω	350 V
60 - 300 V	300 K Ω	500 V
100 - 500 V	510 K Ω	600 V

Hysteresis

App. 10 %.
The hysteresis can be extended to app. 75 % by connecting a suitable resistor between pins 8 and 9.
Resistor limits are 470 K Ω /3 K Ω (0.25 W).
The hysteresis will increase by decreasing resistance.

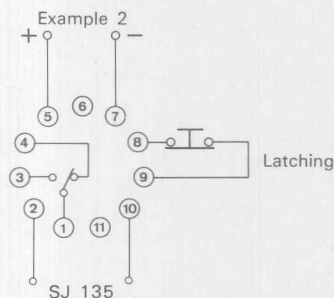
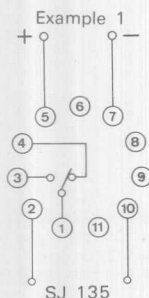
Latching

By interconnecting pins 8 and 9 the relay will latch at set level until either the supply voltage or the interconnection is interrupted.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



Note:
Internal connection between pins 7 and 10 at DC supply.
No current is to be drawn through this internal connection.

MODE OF OPERATION

Example 1

DC VOLTAGE METERING.

The relay will operate when the actual voltage equals the set value.
The relay releases when the voltage drops min. 10 % below the set value (see hysteresis) or when the supply voltage is disconnected.

Example 2

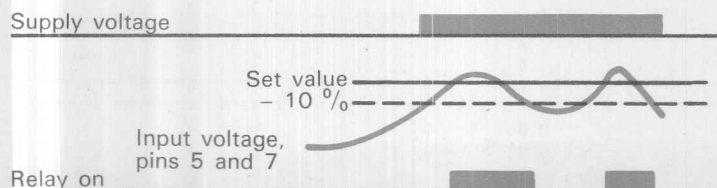
DC VOLTAGE METERING. LATCHING.

The relay will operate and remain in operating position when the actual voltage equals the set value.
Provided that the voltage has dropped min. 10 % below the set value (see hysteresis), the relay will release when the interconnection between pins 8 and 9 is interrupted.

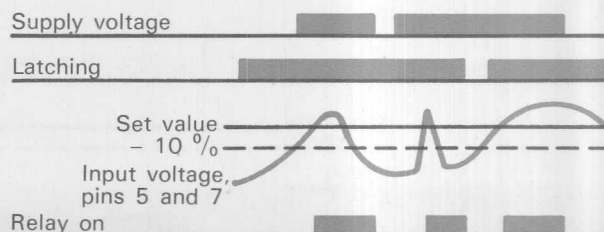
The relay also releases when the supply voltage is disconnected.

OPERATION DIAGRAMS

Example 1



Example 2





SJ 155
Knob-adjustable

SJ 155

- * AC current metering relay with absolute scale and internal shunt.
- * Metering range: 0.2 mA - 5 AAC, divided into 6 sub-ranges.
- * Knob-adjustable trip point.
- * Latching at set level possible.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Metering ranges

Scale ranges	Internal resistance	Max. current
0.2- 1 mA	100 Ω	10 mA
4 - 20 mA	5.1 Ω	100 mA
20 -100 mA	1 Ω	500 mA
100 -500 mA	0.2 Ω	2 A
0.4- 2 A	0.05 Ω	6 A
1 - 5 A	0.02 Ω	10 A

The scale range equals the rms-value of a sinusoidal current.

Hysteresis

App. 10 %.
The hysteresis can be extended to app. 75 % by connecting a suitable resistor between pins 8 and 9. Resistor limits are 470 K Ω /3 K Ω (0.25 W). The hysteresis will increase by decreasing resistance.

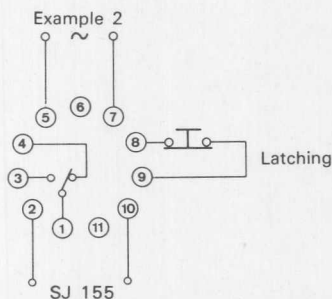
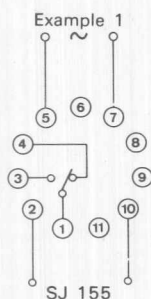
Latching

By interconnecting pins 8 and 9 the relay will latch at set level until either the interconnection or the supply voltage is interrupted.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



Note:
Internal connection between pins 7 and 10 at DC supply. No current is to be drawn through this internal connection.

MODE OF OPERATION

The relay meters the average of a sinusoidal current, and converts it into rms-value. It is thus the rms-value which is set on the built-in potentiometer.

Example 1

AC CURRENT METERING.

The relay will operate when the current equals the set value.

The relay will release when the current has again dropped min. 10 % below the set value (see hysteresis), or when the supply voltage is disconnected.

Example 2

AC CURRENT METERING. LATCHING.

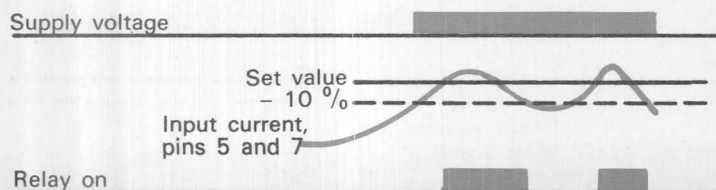
The relay will operate and remain in operating position when the current equals the set value.

Provided that the current has dropped min. 10 % below the set value (see hysteresis), the relay will release when the interconnection between pins 8 and 9 is interrupted.

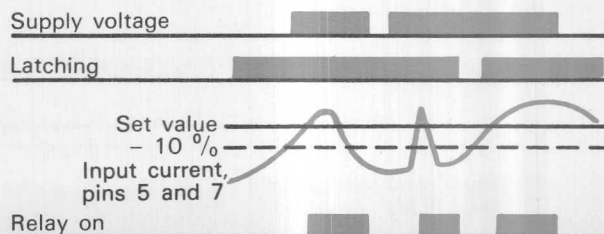
The relay also releases when the supply voltage is disconnected.

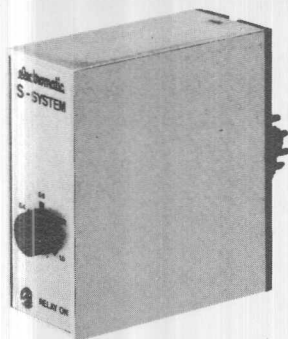
OPERATION DIAGRAMS

Example 1



Example 2





SJ 175
Knob-adjustable

SJ 175

- * AC current metering relay.
- * Metering range: 0.2 – 5 AAC, divided into 2 sub-ranges.
- * For use in conjunction with through-primary current transformer type CT3A.
- * Knob-adjustable trip point.
- * Latching at set level possible.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10–12.

Metering ranges

Scale ranges	Internal resistance	Max. current
0.2-1 AAC 1 -5 AAC	0.1 Ω 0.02 Ω	2 AAC 10 AAC
The scale range equals the rms-value of a sinusoidal current.		

Hysteresis

App. 10 %.
The hysteresis can be extended to app. 75 % by connecting a suitable resistor between pins 8 and 9. Resistor limits are 470 K Ω /3 K Ω (0.25 W). The hysteresis will increase by decreasing resistance.

Latching

By interconnecting pins 8 and 9 the relay will latch at set level until either the supply voltage or the interconnection is interrupted.

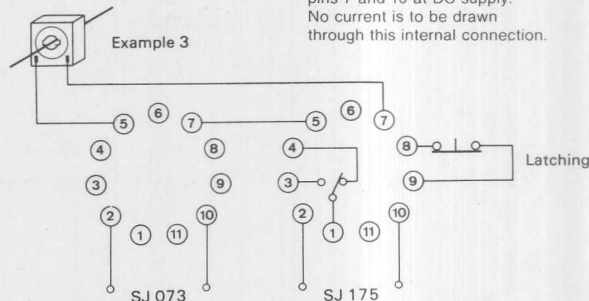
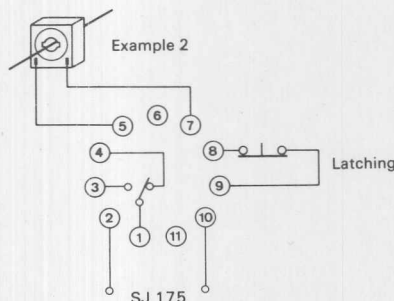
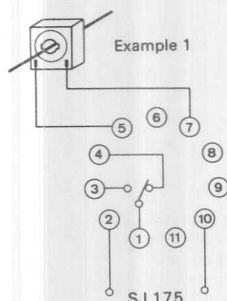
No latching at DC supply.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.
Through-primary current transformer type CT3A.

See catalogue on accessories.

WIRING DIAGRAMS



Note:
Internal connection between pins 7 and 10 at DC supply. No current is to be drawn through this internal connection.

MODE OF OPERATION

The relay meters the average of a sinusoidal current, and converts it into rms-value. It is thus the rms-value which is set on the built-in potentiometer.

Example 1.

AC CURRENT METERING.
In conjunction with through-primary current transformer, e.g. type CT3A (see catalogue on accessories). The relay operates, when the current equals the set value. The relay releases again, when the current has dropped minimum 10% below the set value (see hysteresis). It is here provided that the primary current does not exceed values that might injure

the loads in the secondary circuit of the transformer. This can be obtained e.g. by employing fuses in the primary circuit.

Example 2

AC CURRENT LIMITER. LATCHING.
In conjunction with through-primary current transformer, e.g. type CT3A. The diagram shows the SJ 175 employed as a current limiter with latching. A kWh-meter and a measuring instrument can be connected. The relay operates, when the measured current reaches the set value. By this a contactor can be activated thus either interrupting the primary current wholly/partly, or short-

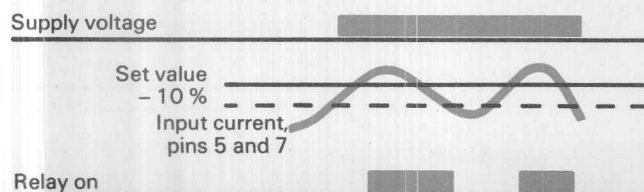
circuiting the input (pins 5-7) of the SJ 175. The latching is reset, when a new measurement is required, provided that the measuring current is below the set value minus the hysteresis.

Example 3

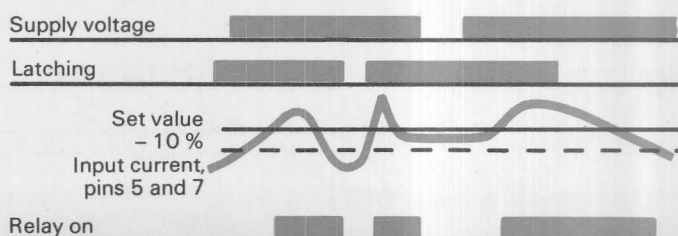
As example 2: here, however, the analogue panel indicator type SJ 073 with columnar LED display is used instead of a measuring instrument. And here the short-circuiting, if any, of the inputs can be performed by a contactor between pin 5 of the SJ 073 and pin 7 of the SJ 175.

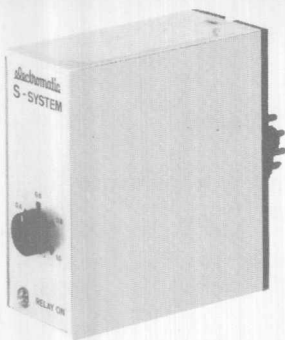
OPERATION DIAGRAMS

Example 1



Example 2 and 3





SJ 185
Knob-adjustable

SJ 185

- * AC voltage metering relay with absolute scale.
- * Metering range: 20 mV - 500 VAC, divided into 8 sub-ranges.
- * Knob-adjustable trip point.
- * Latching at set level possible.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

**Common technical data
and ordering key**
Pages 10-12.

Metering ranges

Scale ranges	Internal resistance	Max. voltage
20 - 100 mV	100 Ω	1 V
0.2 - 1 V	1 K Ω	10 V
2 - 10 V	10 K Ω	50 V
4 - 20 V	20 K Ω	100 V
10 - 50 V	51 K Ω	150 V
30 - 150 V	150 K Ω	350 V
60 - 300 V	300 K Ω	500 V
100 - 500 V	510 K Ω	600 V

The scale range equals the rms-value of a sinusoidal voltage.

Hysteresis

App. 10 %.
The hysteresis can be extended to app. 75 % by connecting a suitable resistor between pins 8 and 9. Resistor limits are 470 K Ω /3 K Ω (0.25 W). The hysteresis will increase by decreasing resistance.

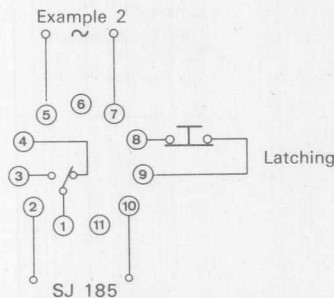
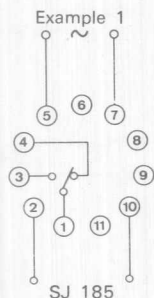
Latching

By interconnecting pins 8 and 9 the relay will latch at set level until either the interconnection or the supply voltage is interrupted.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



Note:
Internal connection between pins 7 and 10 at DC supply.
No current is to be drawn through this internal connection.

MODE OF OPERATION

The relay meters the average of a sinusoidal voltage, and converts it to rms-value which is set on the potentiometer (knob-adjustable).

Example 1

AC VOLTAGE METERING.

The relay will operate when the voltage equals the set value.
The relay releases again when the voltage has dropped min. 10 % below the set value (see hysteresis), or when the supply voltage is disconnected.

Example 2

AC VOLTAGE METERING. LATCHING.

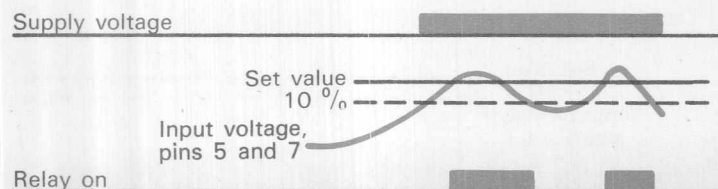
The relay will operate and remain in operating position when the voltage equals the set value.

Provided that the voltage has dropped min. 10 % below the set value (see hysteresis), the relay will release when the interconnection between pins 8 and 9 is interrupted.

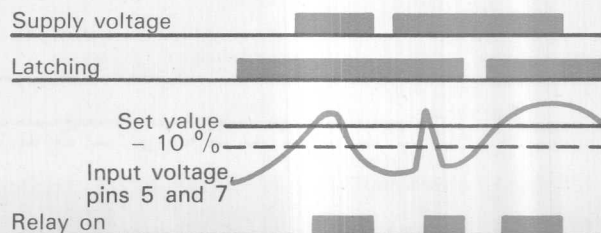
The relay also releases when the supply voltage is disconnected.

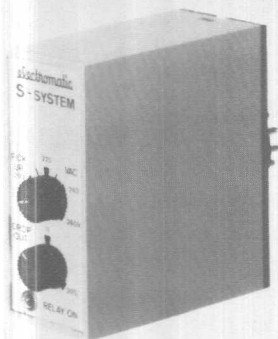
OPERATION DIAGRAMS

Example 1



Example 2





SJ 195
2 built-in
potentiometers

SJ 195

- * AC voltage metering relay.
- * Measures on its own supply voltage.
- * Measuring ranges: 20-28 VAC, 100-140 VAC, or 180-260 VAC.
- * Hysteresis: 2 to 20%.
- * Knob-adjustable trip point and hysteresis.
- * Can be used in conjunction with analogue panel indicator type SJ 093.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Ranges of measurement

Type	Measuring range
SJ 195 024	20- 28 VAC
SJ 195 120	100-140 VAC
SJ 195 220	180-260 VAC

The scale range equals the r.m.s. value of a sinusoidal voltage.

Hysteresis

Knob-adjustable between 2 and 20% of the set trip point.

Adjustment

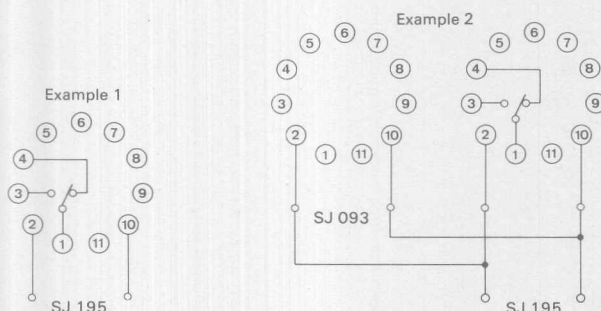
Top potentiometer:
Adjustment of required trip point (volts).
Absolute scale.

Bottom potentiometer:
Adjustment of required hysteresis (%).
Absolute scale.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

WIRING DIAGRAMS



MODE OF OPERATION

The relay measures the average of its own sinusoidal supply voltage and converts it into r.m.s.-value. It is thus the r.m.s.-value which is set on the top potentiometer. The trip point is set on the top absolute scale in volts.
The hysteresis is set on the bottom absolute scale between 2 and 20% of the trip point. The relay operates, when the supply voltage reaches the set trip point.

The relay releases, when the supply voltage has decreased to a value equal to the set trip point minus the set hysteresis.
Example: Set trip point 220 VAC, set hysteresis 10% equalling 22 VAC, voltage at release 198 VAC. The relay does not operate again, till the trip point (220 VAC) has been reached.

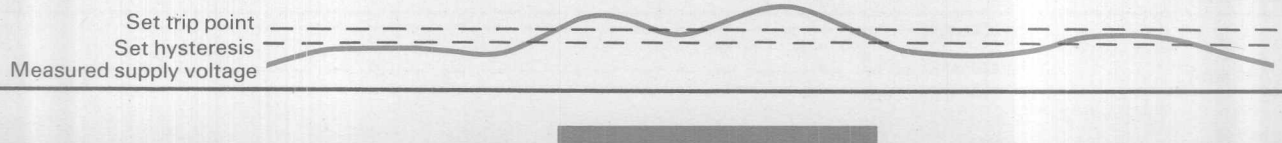
Example 1

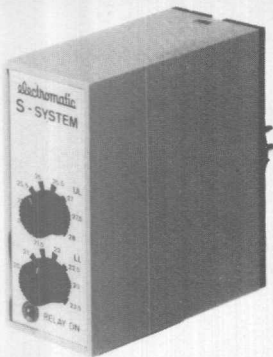
The relay measures on its own supply voltage.

Example 2

The supply voltage is connected both to voltage metering relay type SJ 195 and analogue panel indicator type SJ 093. The indicator shows the value of the measured alternating voltage on a columnar LED display, while the voltage metering relay functions as mentioned before.

OPERATION DIAGRAM





SJJ 195
2 built-in
potentiometers

SJJ 195

- * AC voltage metering relay.
- * Measures on own supply voltage.
- * Measuring ranges: 20-28 VAC, 100-140 VAC, or 180-260 VAC.
- * Hysteresis: App. 1%.
- * Upper and lower limits separately adjusted.
- * Can be used in conjunction with analogue panel indicator type SJ 093.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Hysteresis

The hysteresis in relation to the measuring voltage is app. - 1 % for the upper trip point and app. + 1 % for the lower trip point.

Adjustment

Top potentiometer:
Adjustment of upper limit.
Absolute scale in volts.

Bottom potentiometer:
Adjustment of lower limit.
Absolute scale in volts.

Accessories

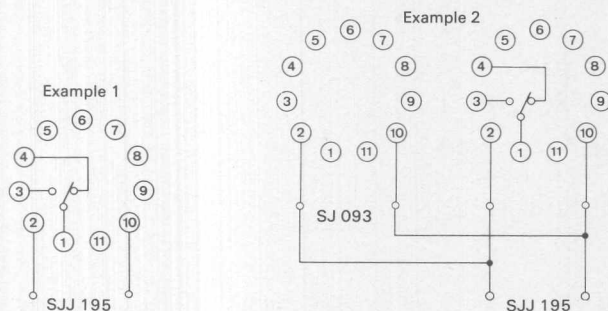
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Ranges of measurement

Type	Measuring range	Lower limit	Upper limit
SJJ 195 024	20- 28 VAC	20- 23.5 VAC	24.5- 28 VAC
SJJ 195 120	100-140 VAC	100-118 VAC	122 -140 VAC
SJJ 195 220	180-260 VAC	180-217 VAC	223 -260 VAC

The measuring range equals the r.m.s. value of a sinusoidal voltage.

WIRING DIAGRAMS



MODE OF OPERATION

The SJJ 195 measures the average of its own sinusoidal supply voltage and converts it into r.m.s.-value. It is thus the r.m.s.-value which is set on the built-in potentiometers.

The relay stays on as long as the value of the measured supply voltage is between a lower and an upper limit. The two limits are separately adjusted.

If the supply voltage rises above the upper limit or drops below the lower limit, the relay releases. The relay operates again, when the voltage is inside the set limits. Hysteresis on operate: App. 1%.

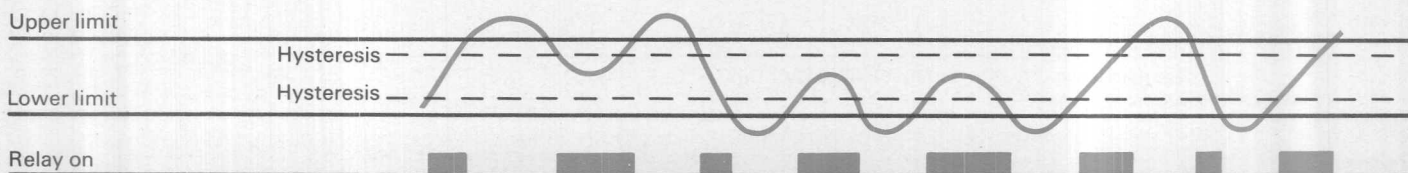
Example 1

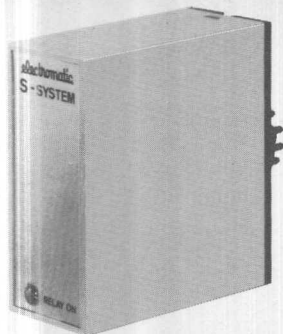
The relay measures on its own supply voltage.

Example 2

The supply voltage is connected both to voltage metering relay type SJJ 195 and analogue panel indicator type SJ 093. The indicator shows the value of the measured alternating voltage on a columnar LED display, and the voltage metering relay operates, when the value of the measured voltage is between the two limits set on the relay.

OPERATION DIAGRAM





SL 100

- * Logic relay »or« - »nor« - »and« - »nand«.
- * Negative logic.
- * 32 possibilities of combination on 5 inputs.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SL 100

TECHNICAL DATA

Common technical data and ordering key

Pages 10-12.

Inputs

3 signal inputs:
Pins 5-6 and 7.

2 function inputs:
Pins 8 and 9.

Common negative:
Pin 11.

Data on inputs

The signal- and the function inputs have equal technical data.

Control voltage

Internal voltage:
10 VDC.

Negative logic

Logical »0« corresponds to open input (10 VDC).
Logical »1« corresponds to short-circuited input (0 VDC).

Input voltage for positive

»0«-function
Min. 6 V.

Input voltage for positive

»1«-function
Max. 3 V.

Input resistance

10 K Ω .

Short-circuit current

1 mA.

Pulse duration

10 ms - ∞

Contact resistance

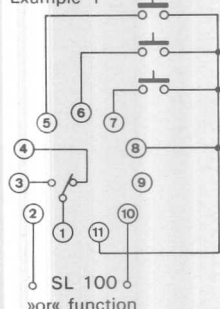
Max. 8 K Ω .

Accessories

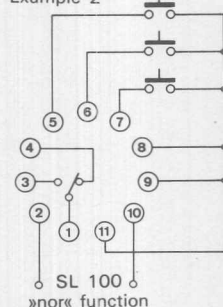
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

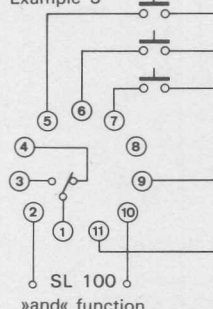
Example 1



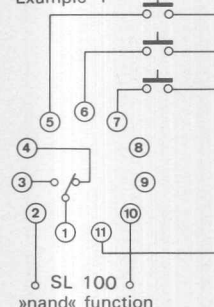
Example 2



Example 3



Example 4



MODE OF OPERATION

This logic relay, being equipped with 3 signal inputs and 2 inputs controlling the function, is universally applicable for »or«, »nor«, »and«, »nand« functions. The function is at any time determined by the way in which signals on the function terminals are combined. See examples 1 to 4. The signal voltage (10 VDC) is supplied by the logic relay. Signals can, on all 5 inputs, be handled by ordinary metallic switches and/or by NPN-transistors with open collector. The emitters are connected to pin 11.

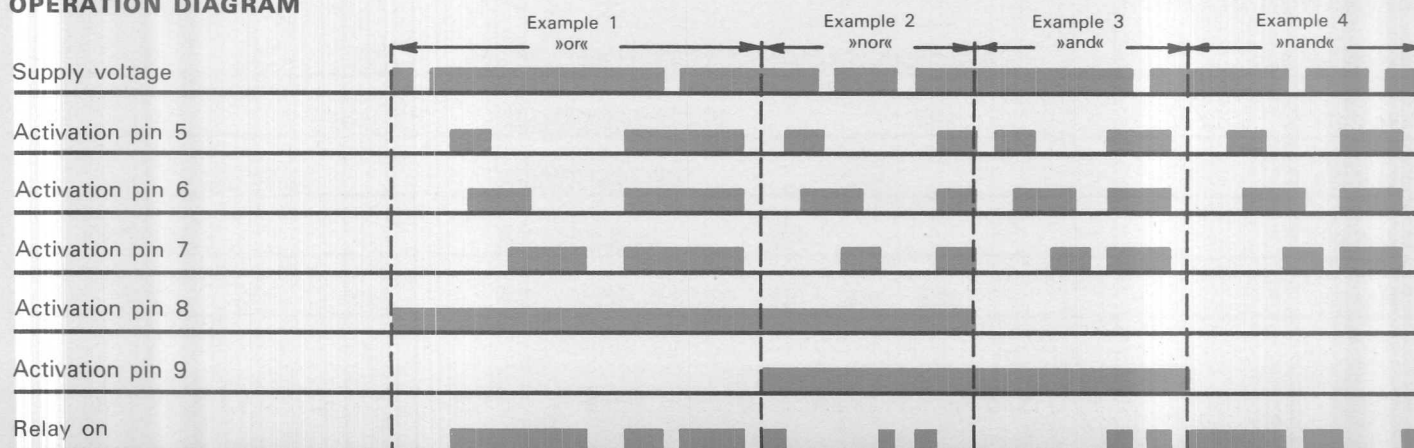
Example 1 The relay operates when one or more of the three signal inputs are connected to pin 11. (»or«-function).

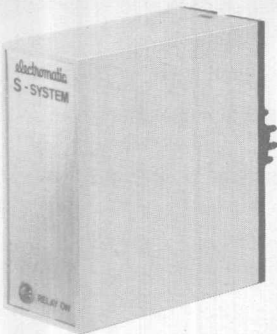
Example 2 The relay releases when one or more of the three signal inputs are connected to pin 11. (»nor«-function).

Example 3 The relay operates when all three signal inputs are connected to pin 11. (»and«-function). Unused inputs to be connected directly to pin 11.

Example 4 The relay releases when all three signal inputs are connected to pin 11. (»nand«-function). Unused inputs to be connected directly to pin 11.

OPERATION DIAGRAM





SL 110

SL 110

- * Logic relay »or«.
- * Positive logic.
- * 3 signal inputs.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

TECHNICAL DATA

Common technical data and ordering key

Pages 10–12.

Inputs

3 signal inputs:
Pins 5–6 and 7.

Common negative:
Pin 8.

Control voltage

Internal control voltage:
10 VDC.

Pin 9 positive.
(Example 1).

External control voltages
4–24 VAC/DC without
dropping resistors in series
with the inputs.

At a higher voltage than
24 VAC/DC use dropping
resistors 1 K Ω /V, 0.5 W
in series with the inputs.
(Example 2).

Input resistance

10 K Ω .

Short-circuit current

1 mA.

Pulse duration

20 ms - ∞

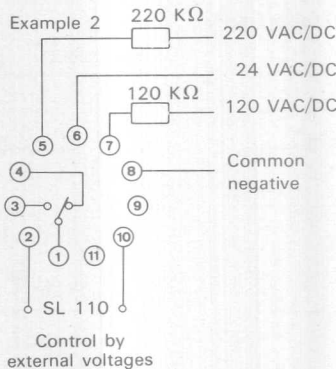
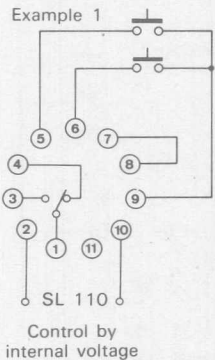
Contact resistance

Max. 8 K Ω .

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



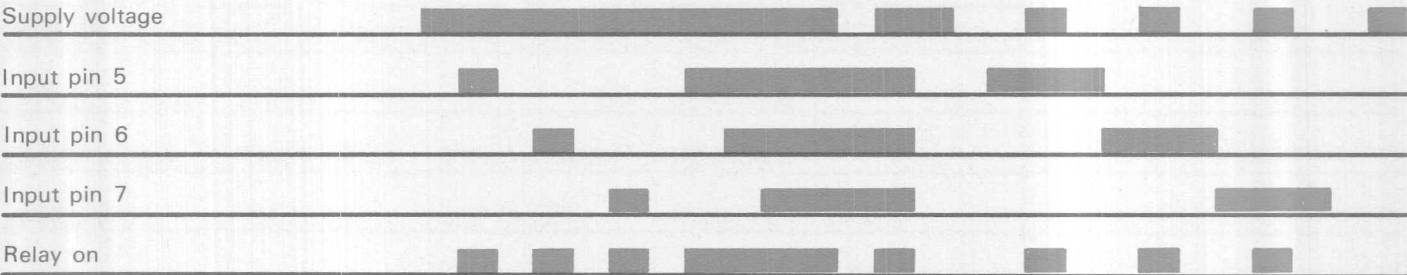
MODE OF OPERATION

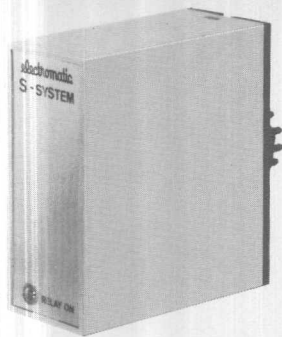
The relay operates when a control voltage is present at one or more of the inputs. This voltage can be internal, external or be a mixture of these voltages.

Example 1 Control by internal voltage from pin 9. Unused inputs, in this case pin 7, are to be connected to pin 8.

Example 2 Control by external voltages. Pin 8 is used as common negative. At control voltages higher than 24 VAC/DC use dropping resistors, 1 K Ω /V, 0.5 W in series with the inputs, pins 5–6 and 7. Unused inputs are in this case also to be connected to pin 8.

OPERATION DIAGRAM





SL 120

- * Logic relay »nor«.
- * Positive logic.
- * 3 signal inputs.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SL 120

TECHNICAL DATA

Common technical data and ordering key

Pages 10–12.

Inputs

3 signal inputs:
Pins 5-6 and 7.
Common negative:
Pin 8.

Control voltage

Internal control voltage
10 VDC.
Pin 9 positive.
(Example 1).

External control voltages
4-24 VAC/DC without
dropping resistors in series
with the inputs.
At a higher voltage than
24 VAC/DC use dropping
resistors 1 K Ω /V, 0.5 W
in series with the inputs.
(Example 2).

Input resistance

10 K Ω .

Short-circuit current

1 mA.

Pulse duration

20 ms - ∞

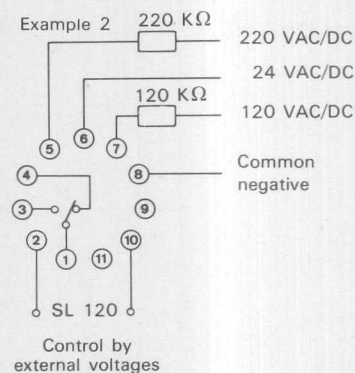
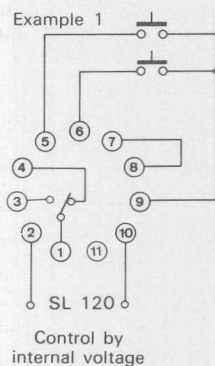
Contact resistance

Max. 8 K Ω .

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



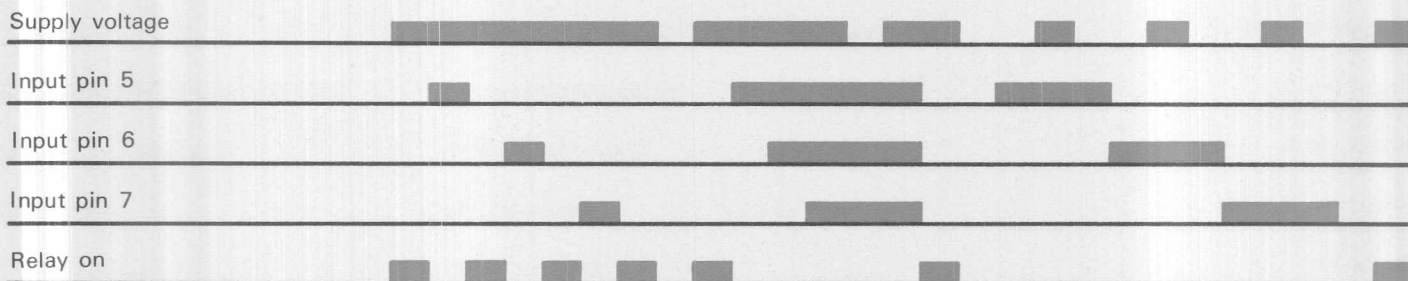
MODE OF OPERATION

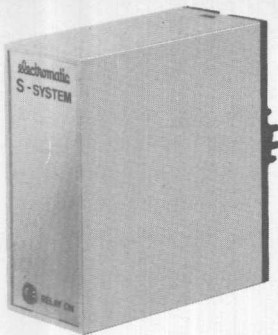
The relay releases when a control voltage is present at one or more of the inputs. This voltage can be internal, external or be a mixture of these voltages.

Example 1 Control by internal voltage from pin 9. Unused inputs, in this case pin 7, are to be connected to pin 8.

Example 2: Control by external voltages. Pin 8 is used as common negative. At control voltages higher than 24 VAC/DC use dropping resistors, 1 K Ω /V, 0.5 W in series with the inputs, pins 5-6 and 7. Unused inputs are in this case also to be connected to pin 8.

OPERATION DIAGRAM





SL 130

SL 130

- * Logic relay »and«.
- * Positive logic.
- * 3 signal inputs.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

TECHNICAL DATA

Common technical data and ordering key

Pages 10-12.

Inputs

3 signal inputs:
Pins 5-6 and 7.

Common negative:
Pin 8.

Control voltage

Internal control voltage:
10 VDC.
Pin 9 positive.
(Example 1).

External control voltages
4-24 VAC/DC without
dropping resistors in series
with the inputs.
At a higher voltage than
24 VAC/DC use dropping
resistors 1 K Ω /V, 0.5 W
in series with the inputs.
(Example 2).

Input resistance

10 K Ω .

Short-circuit current

1 mA.

Pulse duration

20 ms - ∞

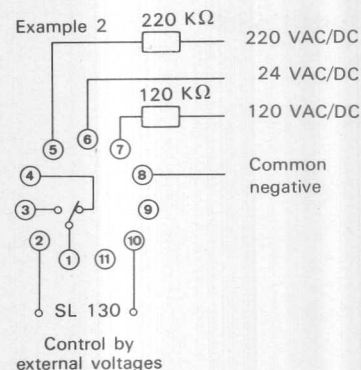
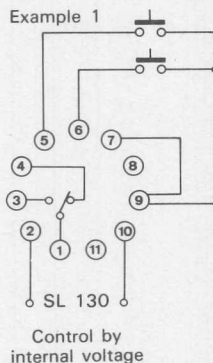
Contact resistance

Max. 8 K Ω .

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



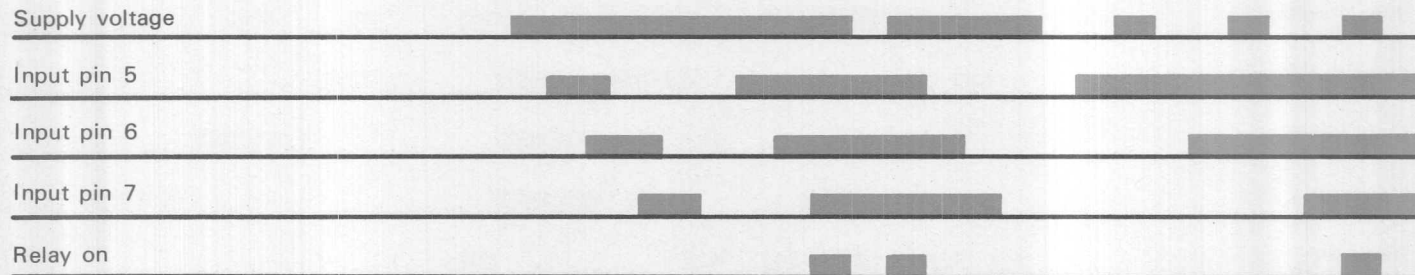
MODE OF OPERATION

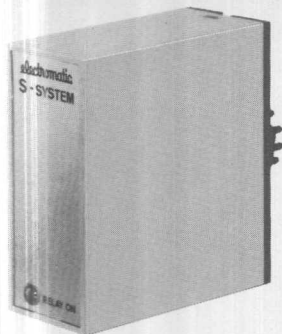
The relay operates when a control voltage is present at all three inputs. This voltage can be internal, external or be a mixture of these voltages.

Example 1 Control by internal voltage from pin 9. Unused inputs, in this case pin 7, are to be connected to pin 9.

Example 2 Control by external voltages. Pin 8 is used as common negative. At control voltages higher than 24 VAC/DC use dropping resistors, 1 K Ω /V, 0.5 W in series with the inputs, pins 5-6 and 7. Unused inputs are in this case also to be connected to pin 9.

OPERATION DIAGRAM





SL 140

- * Logic relay »nand«.
- * Positive logic.
- * 3 signal inputs.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SL 140

TECHNICAL DATA

Common technical data and ordering key

Pages 10-12.

Inputs

3 signal inputs:
Pins 5-6 and 7.

Common negative:
Pin 8.

Control voltage

Internal control voltage:
10 VDC.
Pin 9 positive.
(Example 1).

External control voltages
4-24 VAC/DC without
dropping resistors in series
with the inputs.
At a higher voltage than
24 VAC/DC use dropping
resistors 1 K Ω /V, 0.5 W
in series with the inputs.
(Example 2).

Input resistance

10 K Ω .

Short-circuit current

1 mA.

Pulse duration

20 ms - ∞

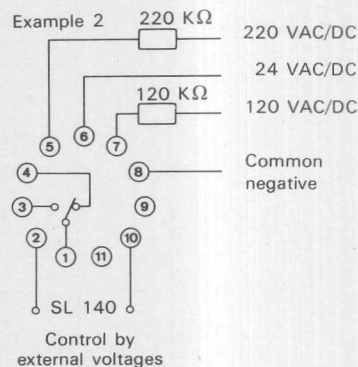
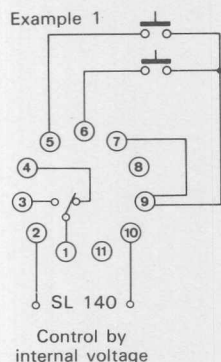
Contact resistance

Max. 8 K Ω .

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



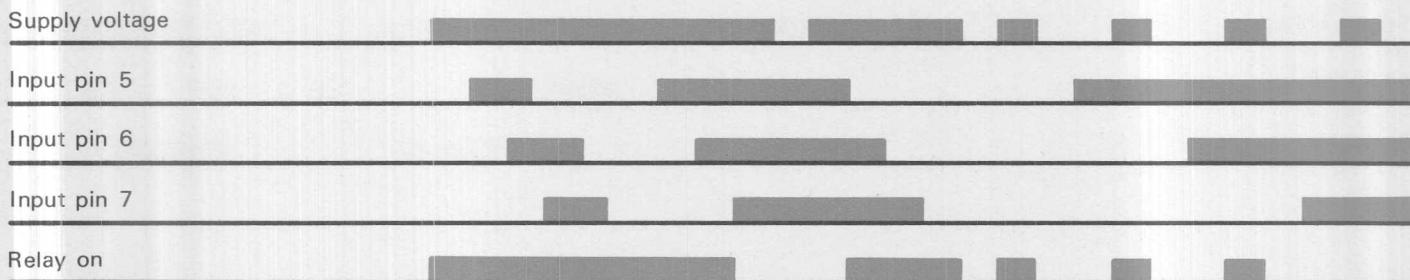
MODE OF OPERATION

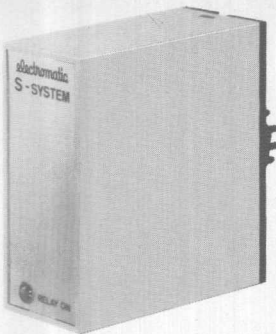
The relay releases when a control voltage is present at all three inputs. This voltage can be internal, external or be a mixture of these voltages.

Example 1 Control by internal voltage from pin 9. Unused inputs, in this case pin 7, are to be connected to pin 9.

Example 2 Control by external voltages. Pin 8 is used as common negative. At control voltages higher than 24 VAC/DC use dropping resistors, 1 K Ω /V, 0.5 W in series with the inputs, pins 5-6 and 7. Unused inputs are in this case also to be connected to pin 9.

OPERATION DIAGRAM





SL 150

SL 150

- * Logic relay »flip-flop«.
- * Without memory.
- * Negative logic.
- * 1 signal input.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

TECHNICAL DATA

Common technical data and ordering key
Pages 10-12.

Input
1 signal input:
Pin 5.

Internal voltage
24 VDC.
Pin 5 positive.

Short-circuit current
2 mA.

»Shift«
By short-circuiting the internal voltage to pin 7.

Pulse duration
20 ms - ∞

Activation frequency
10 pulses/s.

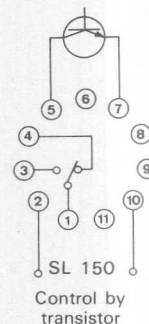
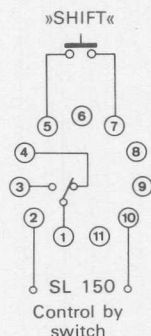
Control by transistor

The relay can be controlled by a NPN-transistor with open collector and the emitter connected to pin 7.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS

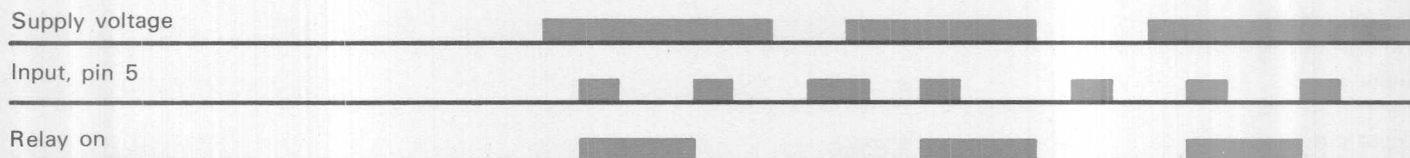


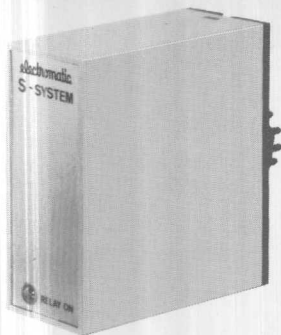
MODE OF OPERATION

Logic relay »flip-flop« without memory.
A short-circuit of the contact function between pins 5 and 7 will change the relay from the »OFF« position to the »ON« position or vice versa.
When the supply voltage is disconnected, the relay releases. (»OFF« position).

Control of the relay either by metallic contact or by NPN-transistor with open collector, and the emitter connected to pin 7.

OPERATION DIAGRAM





SL 160

SL 160

- * Logic relay »flip-flop«.
- * With built-in memory.
- * Negative logic.
- * 1 signal input.
- * 5 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

TECHNICAL DATA

Common technical data and ordering key
Pages 10–12.

Input
1 signal input:
Pin 5.

Internal voltage
24 VDC.
Pin 5 positive.

Short-circuit current
2 mA.

»Shift«
By short-circuiting the internal voltage to pin 7.

Pulse duration
20 ms - ∞

Activation frequency
10 pulses/s.

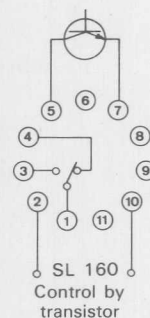
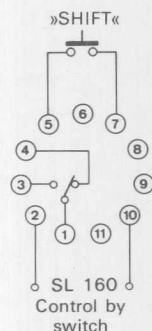
Control by transistor

The relay can be controlled by a NPN-transistor with open collector and the emitter connected to pin 7.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



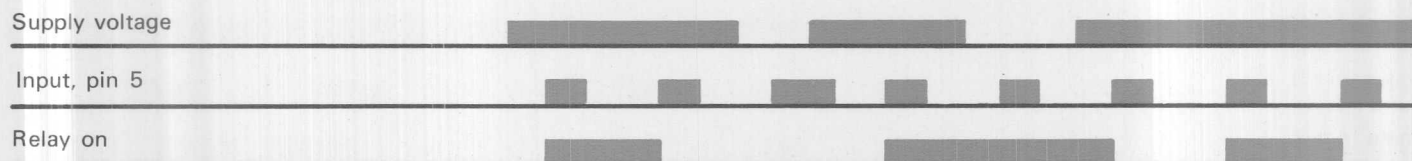
MODE OF OPERATION

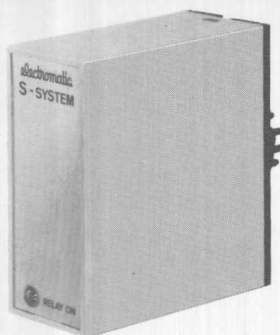
Logic relay »flip-flop« with built-in memory.
A short-circuit of the contact function between pins 5 and 7 will change the relay from the »OFF« position to the »ON« position or vice versa.

Because of the built-in memory the relay will maintain its position, when the supply voltage is disconnected. A short-circuit between pins 5 and 7 while the supply vol-

tage is disconnected will not be registered by the relay. Control of the relay either by metallic contact or by NPN-transistor with open collector, and the emitter connected to pin 7.

OPERATION DIAGRAM





SL 170

SL 170

- * Logic relay »bistable«.
- * Without memory.
- * Negative logic.
- * 2 signal inputs.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

TECHNICAL DATA

Common technical data and ordering key

Pages 10-12.

Inputs

2 signal inputs:
Pins 5 and 7.

Activation frequency

10 pulses/s.

Pulse duration

20 ms - ∞

Shift to »ON«

By a short-circuit
between pins 5 and 6.

Internal voltage

24 VDC.
Pin 5 positive.

Short-circuit current

2 mA.

Shift to »OFF«

By a short-circuit
between pins 6 and 7.

Internal voltage

15 VDC.
Pin 7 positive.

Short-circuit current

2 mA.

The »OFF« position has
priority.

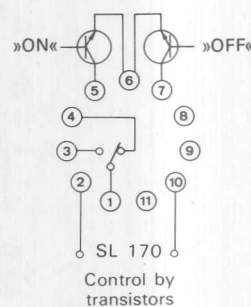
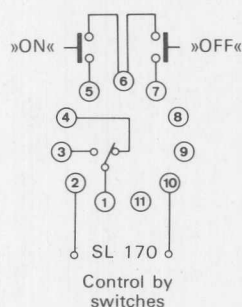
Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

Control by transistor

The relay can be controlled
by NPN-transistors with
open collectors and the
emitters connected to pin 6.

WIRING DIAGRAMS



MODE OF OPERATION

Logic relay »bistable« without
memory.

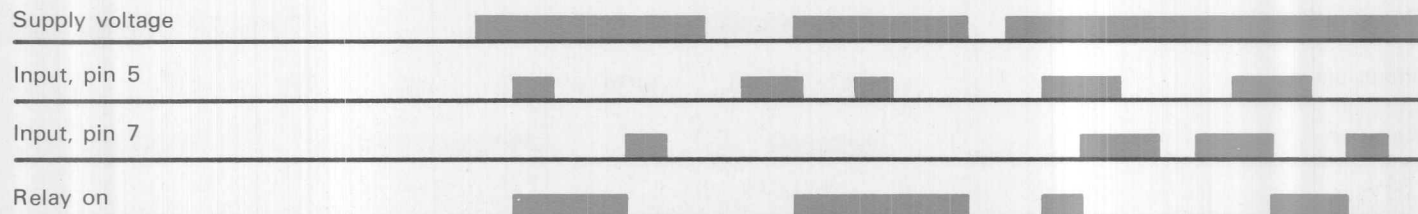
A short-circuit of the contact
function between pins 5 and 6 will
change the relay to the »ON« posi-
tion.

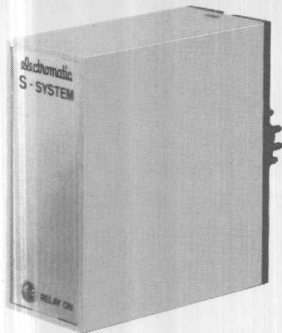
A short-circuit of the contact
function between pins 6 and 7 will
change the relay to the »OFF« posi-
tion.

More pulses to the same signal in-
put is registered as only one pulse.
When the supply voltage is discon-
nected, the relay releases.
»OFF« position.

Control of the relay either by
metallic contacts or by
NPN-transistors with open
collectors, and the emitters
connected to pin 6.

OPERATION DIAGRAM





SL 180

- * Logic relay »bistable«.
- * With built-in memory.
- * Negative logic.
- * 2 signal inputs.
- * 5 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SL 180

TECHNICAL DATA

Common technical data and ordering key
Pages 10–12.

Inputs
2 signal inputs:
Pins 5 and 7.

Activation frequency
10 pulses/s.

Pulse duration
20 ms - ∞

Shift to »ON«
By a short-circuit
between pins 5 and 6.

Internal voltage
24 VDC.
Pin 5 positive.

Short-circuit current
2 mA.

Shift to »OFF«
By a short-circuit
between pins 6 and 7.

Internal voltage
15 VDC.
Pin 7 positive.

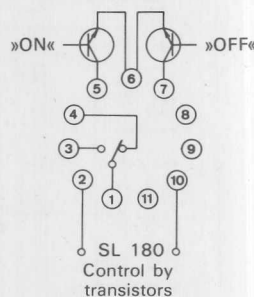
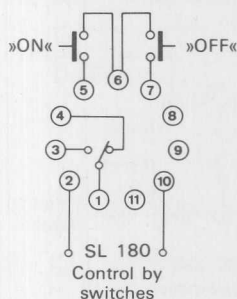
Short-circuit current
2 mA.

The »OFF« position has
priority.

Accessories
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

Control by transistor
The relay can be controlled
by NPN-transistors with
open collectors and the
emitters connected to pin 6.

WIRING DIAGRAMS



MODE OF OPERATION

Logic relay »bistable« with memory.
A short-circuit of the contact
function between pins 5 and 6
will change the relay to the
»ON« position.

A short-circuit of the contact
function between pins 6 and 7
will change the relay to the
»OFF« position.

More pulses to the same signal in-
put is registered as only one pulse.
Because of the built-in memory
the relay will maintain its
position, when the supply
voltage is disconnected.

A short-circuit between pins
5 and 6 or pins 6 and 7 while
the supply voltage is discon-
nected will not be registered by
the relay.

Control of the relay either by
metallic contacts or by
NPN-transistors with open
collectors, and the emitters
connected to pin 6.

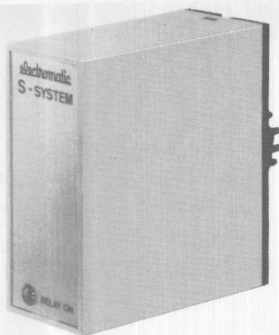
OPERATION DIAGRAM

Supply voltage

Input, pin 5

Input, pin 7

Relay on



SL 190

SL 190

- * Logic relay »or« - »nor« - »and« - »nand«.
- * Positive logic for the signal inputs.
- * Negative logic for the function inputs.
- * 32 possibilities of combination on 5 inputs.
- * External voltage for the signal inputs.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

TECHNICAL DATA

Common technical data and ordering key

Pages 10-12.

Inputs

3 signal inputs:
Pins 5 - 6 and 7.
Positive logic.

2 function inputs:
Pins 8 and 9.
Negative logic.

Common negative:
Pin 11.

Signal inputs

Activated: Logical »1« corresponds to an external voltage of 15 - 24 VAC or 7 - 24 VDC without dropping resistor in series with the input. At a higher voltage use dropping resistor in series with the input. (1 K Ω /V, 0.5 W). Common negative is connected to pin 11. Not activated: Logical »0« corresponds to not applied voltage. Max. 3 VAC/DC.

Function inputs

Activated: Logical »1« corresponds to short-circuited input (pin 11). Not activated: Logical »0« corresponds to open input.

Pin	8	9
Function		
»or«	»0«	»0«
»nor«	»0«	»1«
»and«	»1«	»1«
»nand«	»1«	»0«

Input resistance
20 K Ω .

Short-circuit current
1 mA.

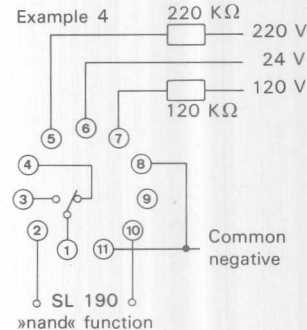
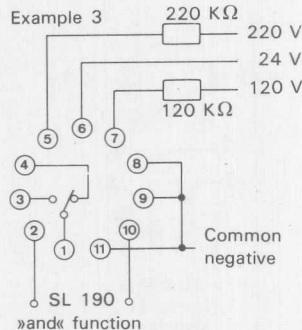
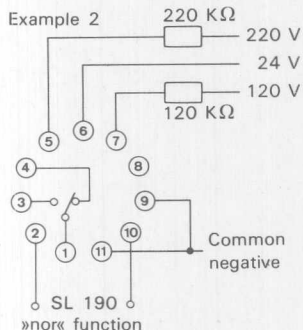
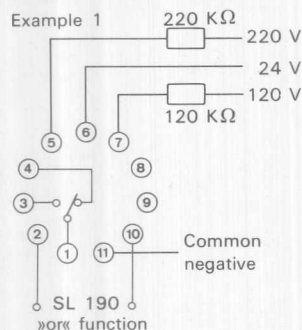
Pulse duration for logical »0« and »1«
50 ms - ∞

Contact resistance
Max. 8 K Ω .

Accessories

Bases. Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAMS



MODE OF OPERATION

This logic relay, being equipped with 3 signal inputs and 2 inputs controlling the function, is universally applicable for »or«, »nor«, »and«, »nand« functions. The function is at any time determined by the way in which signals on the function terminals are combined. See examples 1 to 4. Signals can, on the 2 function inputs, be handled by ordinary metallic switches and/or by NPN-transistors with open collectors. The emitters are connected to pin 11.

The signal inputs are always to be connected to an external voltage, which works as activation signal. Common negative is connected to pin 11.

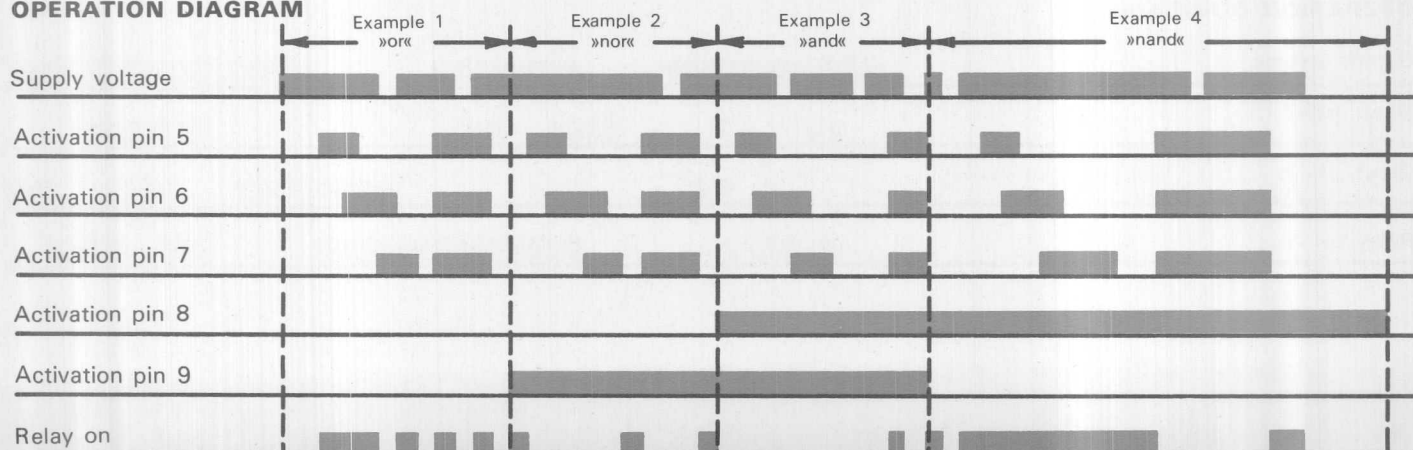
Example 1 The relay operates when one or more of the three signal inputs are connected to an external voltage. (»or« function).

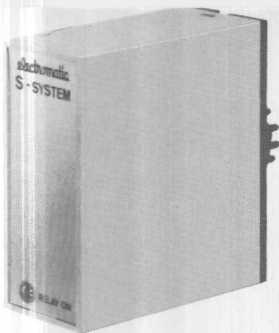
Example 2 The relay releases when one or more of the three signal inputs are connected to an external voltage. (»nor« function).

Example 3 The relay operates when all three signal inputs are connected to external voltages. (»and« function). Unused signal inputs to be connected to logical »1« level.

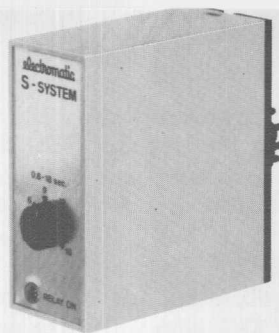
Example 4 The relay releases when all three signal inputs are connected to external voltages. (»nand« function). Unused signal inputs to be connected to logical »1« level.

OPERATION DIAGRAM





SM 100
External resistor
adjustable



SM 105
Knob-adjustable

SM 100/105

- * Pulse-continuity relay.
- * Start at first pulse.
- * Controlled by inductive sensor, capacitive sensor, metallic contact or NPN-transistor.
- * Time range up to 600 s.
- * Adjustment of time either by knob or external time resistor.
- * Repeatability: $\pm 1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT output relay.
- * LED-indication of relay position.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
30 - 600 s.

Range accuracy

+ 5% on max.
- 10% on min.

Repeatability

$\pm 1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature: $\pm 2\%$.

Reset of time

MECHANICAL TRIGGERING:
Pins 5 and 11 interconnected with metallic contact.

2 to 5 VDC - 3 mA.

Pin 5 positive.

Pulse duration: Min. 25 ms.

TRANSISTOR TRIGGERING:

Pins 5 and 11 connected with a pulse generator with NPN-transistor (open collector).

Emitter is connected to pin 11.

2 to 5 VDC - 3 mA.

Pin 5 positive.

Pulse duration: Min. 25 ms.

ELECTRONIC TRIGGERING:

When an inductive sensor type DU, DJ, DO, or a capacitive

sensor type DR connected between pins 6 and 7, is actuated.

8 VDC - 15 mA.

Pin 6 positive.

Pulse duration: Min. 20 ms.

Adjustment of SM 100

External resistor or remote potentiometer R_T .
0 - 1 M Ω , 0.25 W.

The external resistor must be mounted before the S-system will work.

Adjustment of SM 105

Knob-adjustable with scale in seconds.

Setting accuracy: $\pm 10\%$.

Accessories

Bases.

Hold down spring.

Mounting rack.

Base cover.

Front mounting bezel.

Remote potentiometer kit.

Inductive sensors type DU, DJ or DO.

Capacitive sensors type DR.

Mounting bracket type DB 1.

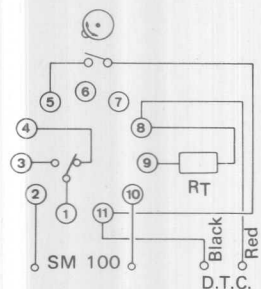
Digital Timer Control

Connection for Digital Timer Control (D.T.C.) between pins 8 and 11.

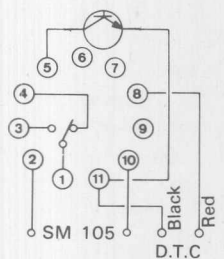
Pin 8 positive.

See catalogue on accessories.

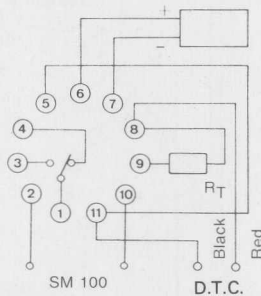
WIRING DIAGRAMS



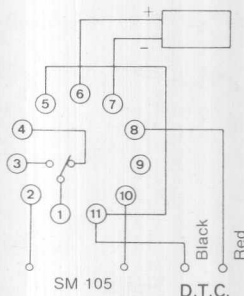
Mechanical triggering
with metallic make contact



Pulse generator trigger
with transistor output



Electronic triggering
with inductive or capacitive sensor



MODE OF OPERATION

This pulse-continuity relay can be used as a speed indicator.

It can be triggered both by inductive sensors, capacitive sensors, ordinary metallic contacts and NPN-transistors, and operates from the front edge of the first pulse¹⁾ and releases after expiration of the set time whether the control pulse has expired or not.

Triggering pulses arriving before the expiration of the set time causes the relay to remain operated for a new full time period.

If the time interval between 2 pulses exceeds the set time, the relay releases, and e.g. thus causing an alarm to start. Typical applications: Controlling that a piston actually is moving, that objects on an assembly line are conveyed properly and without heaping up, or that a periodic control is accomplished with the prescribed intervals.

When the supply voltage is interrupted the relay releases, and the time is reset to zero.

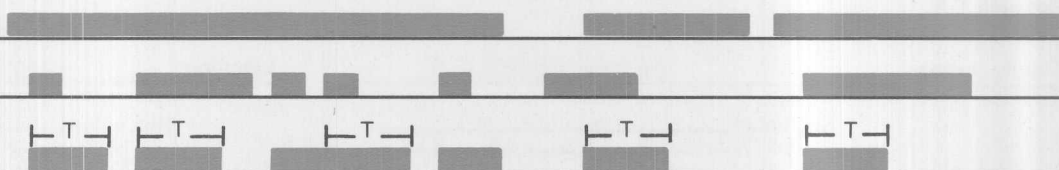
¹⁾ Another pulse-continuity relay, the SP 100/105, operates as soon as the supply voltage is applied.

OPERATION DIAGRAM

Supply voltage

Input pulse

Relay on





SM 115
Knob-adjustable

SM 115

- * Current metering relay for AC.
- * Metering range: 0.1-500 A with current metering transformer.
- * Knob-adjustable trip point.
- * Latching at set level possible.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Input voltage

Pins 5-7: 0.1-4 V.
Max. 20 V.
Pin 5 positive.

Hysteresis

App. 10 %.
The hysteresis can be extended to app. 75 % by connecting a resistor between pins 8-9. Resistor limits are 1 M Ω and 15 K Ω . The hysteresis increases by decreasing resistance.

Latching

The relay shall latch at set level when pins 8 - 9 are interconnected.

AC measurements 1- or 3-phases

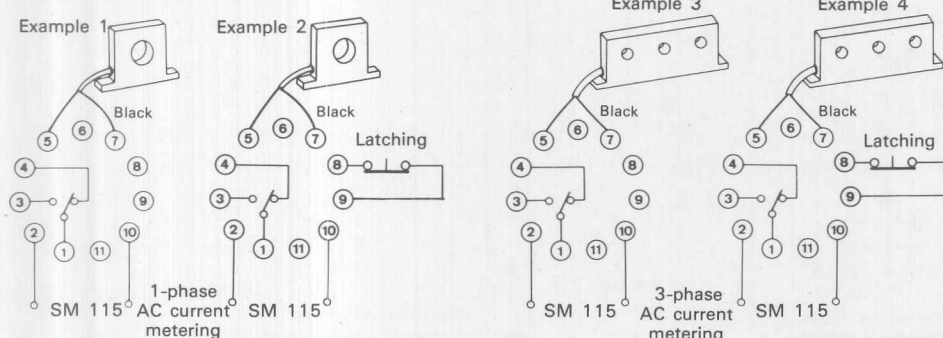
Are made in conjunction with one of the current metering transformers type MI or type MP. These transformers deliver an output voltage between 0.1 and 4 V being proportional with the current flowing in a conductor, drawn through the central hole of the transformer.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Current metering transformers, type MI and type MP.
See catalogue on accessories.

WIRING DIAGRAMS



MODE OF OPERATION

Example 1

AC CURRENT METERING (1-phase).
The relay operates when the current reaches the set value. The relay releases when the current drops at least 10 % below the set value (see hysteresis) or by disconnecting the supply voltage.

Example 2

AC CURRENT METERING (1-phase).
LATCHING.
The relay operates when the current reaches the set value and then latches in operating position. The relay releases by removing the latch, i. e. by opening the

contact between pins 8-9, provided that the current has dropped at least 10 % below the set value (see hysteresis), or by disconnecting the supply voltage.

Example 3

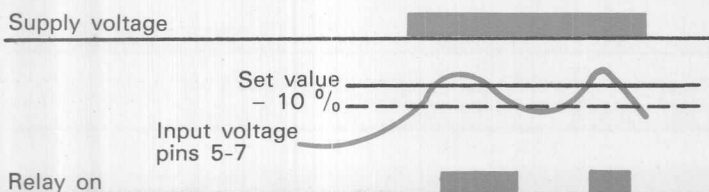
AC CURRENT METERING (3 phases).
The relay operates when the current in any of the phases reaches the set value. The relay releases when the current in all 3 phases drops at least 10 % below the set value (see hysteresis) or by disconnecting the supply voltage.

Example 4

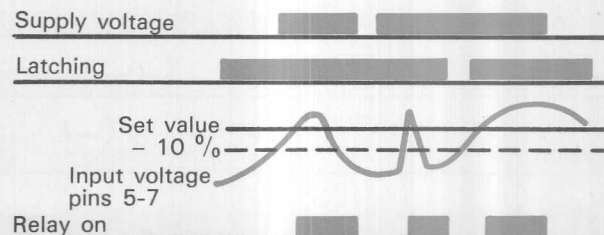
AC CURRENT METERING (3 phases).
LATCHING.
The relay operates when the current in any of the phases reaches the set value and then latches in the operating position. The relay releases by removing the latch, i. e. by opening the contact between pins 8-9, provided that the current in all 3 phases has dropped at least 10 % below the set value (see hysteresis), or by disconnecting the supply voltage.

OPERATION DIAGRAMS

Example 1-3



Example 2-4





SM 125
Knob-adjustable

SM 125

- * AC/DC voltage metering relay.
- * Metering range: 0.1-500 VAC (peak) or VDC, divided into 5 sub-ranges.
- * Knob-adjustable trip point.
- * Latching at set level possible.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Hysteresis

App. 10 %. The hysteresis can be extended to 75 % by connecting a resistor between pins 8-9. Resistor limits are 1 M Ω and 15 K Ω . The hysteresis increases by decreasing resistance.

Latching

The relay shall latch at set level when pins 8-9 are interconnected.

Accessories

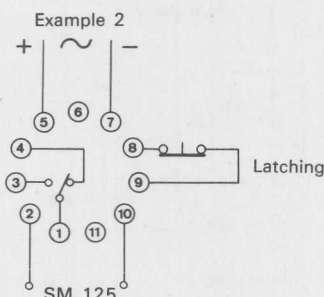
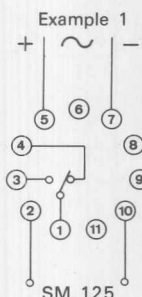
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

Metering ranges:

Scale range	Internal resistance	Max. voltage (peak)
0,1 - 4 VAC/DC	8 K Ω	50 VAC
2 - 20 VAC/DC	50 K Ω	100 VAC
5 - 50 VAC/DC	100 K Ω	200 VAC
20 - 200 VAC/DC	450 K Ω	350 VAC
50 - 500 VAC/DC	1 M Ω	500 VAC

For AC-voltages peak value is metered.

WIRING DIAGRAMS



Note:
At DC supply:

Do not connect pin 7 with pin 10, as these pins are internally connected via a resistor of 3.9 K Ω .

MODE OF OPERATION

Example 1

AC/DC VOLTAGE METERING.

The relay operates when the voltage (peak voltage by AC) reaches the set value.

The relay releases when the voltage drops at least 10 % below the set value (see hysteresis) or by disconnecting the supply voltage.

Example 2

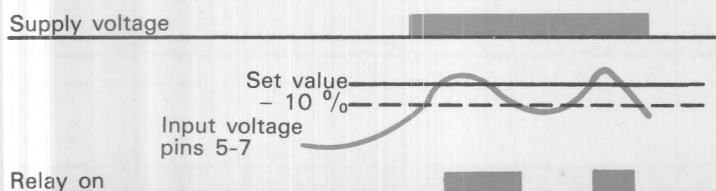
AC/DC VOLTAGE METERING.

LATCHING.

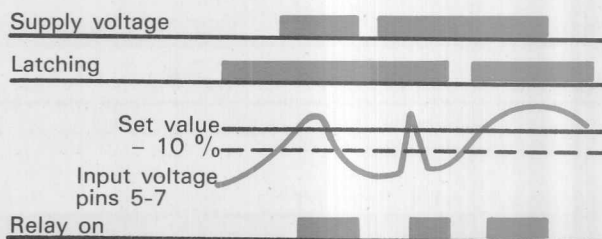
The relay operates when the voltage (peak voltage by AC) reaches the set value and then latches in operating position. The relay releases by removing the latch, i. e. by opening the contact between pins 8-9, provided that the voltage has dropped at least 10 % below the set value (see hysteresis), or by disconnecting the supply voltage.

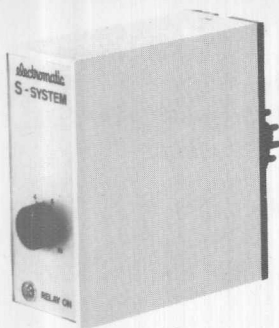
OPERATION DIAGRAMS

Example 1



Example 2





SM 155
Knob-adjustable

SM 155

- * Tachometer relay.
- * 30-10,000 r.p.m. (revolutions/pulses per minute).
- * Inversion of relay function possible.
- * Knob-adjustable.
- * Controlled by inductive sensor, capacitive sensor or metallic contact.
- * Limited sensor voltage and -current (Max.: 8 VDC - 5 mA).
- * Connection for moving-coil instrument.
- * 10 A SPDT output relay.
- * LED-indication of relay position.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Measuring ranges

30 - 10,000 r.p.m.
divided into 3 ranges:
30 - 300 r.p.m.
200 - 2,000 r.p.m.
1,000 - 10,000 r.p.m.

Accuracy of measurement

$\pm 3\%$.

Hysteresis

3% of set value.

Adjustment

Knob-adjustable with relative scale.

Pulse generator

Mechanical triggering with microswitch, reed relay etc, or electronic triggering with inductive sensor type DU, DJ, DO, or capacitive sensor type DR.

Measuring voltage

8 VDC.
Pin 6 positive.

Short-circuit current

Max. 5 mA. Pins 5 and 6.
Max. 10 mA. Pins 6 and 7.

Connection cable

Cable between sensor and relay can be extended as wanted, however resistance:
Max. 100 Ω .

Max. reaction time

The reaction time is measured as the time between 2 pulses at the set value of the potentiometer.

Reaction time: Max. 0.3 s at 200 r.p.m.

Example:

Set value: 1500 r.p.m.
= 25 r.p.s. corresponding to a maximum reaction time of 0.04 s.

Inversion

By interconnecting pins 8 and 11 the relay function will be inverted.

Instrument connection

Connection for moving-coil instrument.

Full scale deflection: 1 mA.

Internal resistance: 110 Ω .

To be connected to pins 8 and 9. Pin 9 positive.

Accessories

Bases.

Hold down spring.

Mounting rack.

Base cover.

Front mounting bezel.

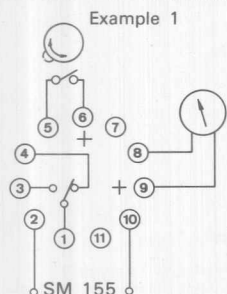
Moving-coil instrument.

Inductive sensor type DU, DJ or DO.

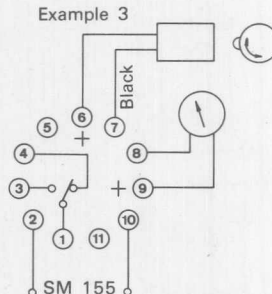
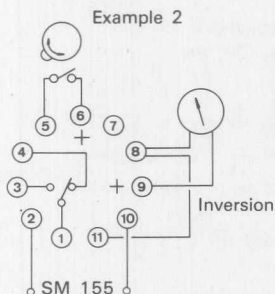
Capacitive sensor type DR.

Mounting bracket type DB 1.

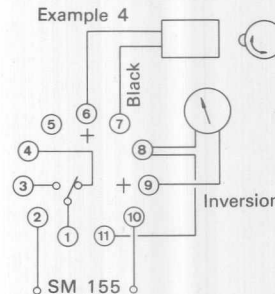
WIRING DIAGRAMS



Mechanical triggering
with metallic contact



Electronic triggering
with inductive or capacitive sensor



MODE OF OPERATION

The relay is controlled by mechanical triggering, e.g. microswitch, reed relay, limit switch etc. (examples 1 and 2), or by electronic triggering, e.g. inductive sensor type DU, DJ, DO, or capacitive sensor type DR (examples 3 and 4).

Examples 1 and 3

The relay operates when the number of r.p.m. exceeds the set value.

The relay releases when the number of r.p.m. gets smaller than the set value. See hysteresis.

Examples 2 and 4

By interconnecting pins 8 and 11 the relay function is inverted, i.e. the relay releases when the number of r.p.m. exceeds the set value.

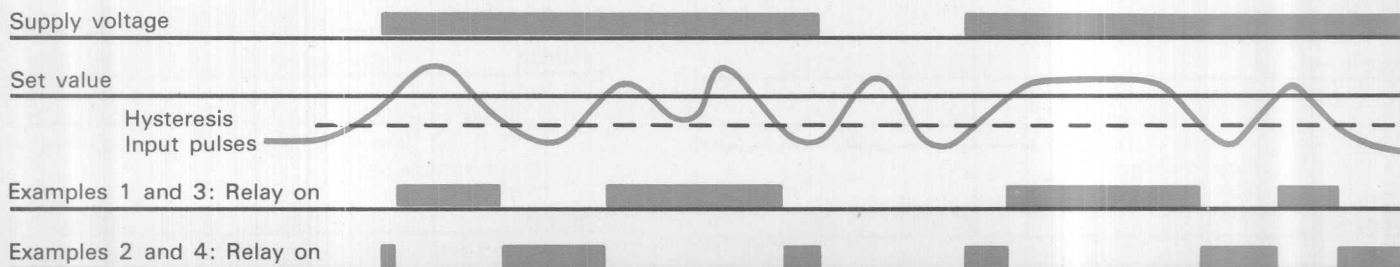
The relay operates when the number of r.p.m. gets smaller than the set value. See hysteresis.

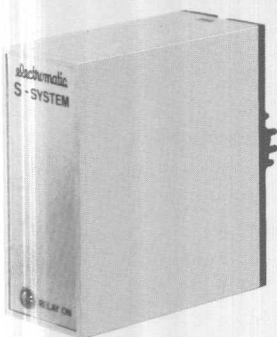
Instrument connection

A moving-coil instrument with a scale calibrated in r.p.m. can be connected to the SM 155. The instrument has 1 mA full scale deflection.

The relay generates max. 8.2 V on the instrument terminals (pins 8 and 9) over an internal resistance of 8.2 K Ω in the relay. The ideal internal resistance of the instrument is 110 Ω , but deviations from this value is not critical, as a deviation of $\pm 100\%$ causes a false reading of only $\pm 1\%$.

OPERATION DIAGRAM





SM 170
No
adjustment

SM 170

- * Phase sequence/Phase breaking relay.
- * Measures on voltage.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * Supply voltage is the 3-phased measuring voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10–12.

Inputs

Pins 5 – 6 and 7.

Measuring voltage – Supply voltage

$3 \times 220 \text{ VAC} + \text{N}$ } $\pm 10\%$
 $3 \times 380 \text{ VAC} + \text{N}$ }

Available for $3 \times 415 \text{ VAC} + \text{N}$ upon request.

The measuring voltage also works as supply voltage.

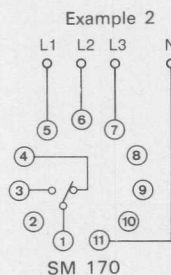
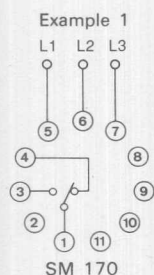
Frequency

45–65 Hz.

Accessories

Bases.
Hold down spring
Mounting rack.
Base covers.
Front mounting bezel.

WIRING DIAGRAMS



MODE OF OPERATION

The relay measures on its own 3-phased supply voltage and operates, when all phases are present and the phase sequence is correct.

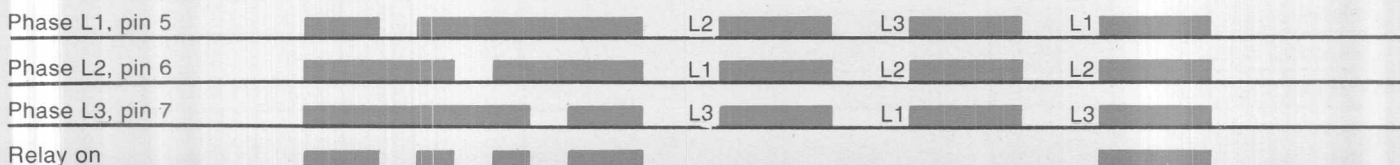
Example 1

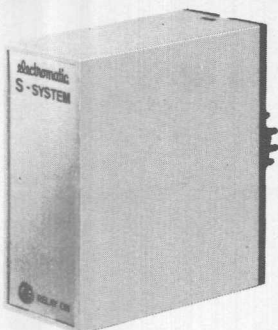
The relay releases in case of interruption of one of the phases, provided that the voltage regenerated by electric motors on the interrupted phase does not exceed 50 % of the nominal voltage.

Example 2

By connecting neutral to pin 11, the sensitivity is slightly improved. At regenerated voltages the amplitude depends on the size and the load of the connected electric motor. In practice the value of the regenerated voltage can be near the same as the value of the supply voltage.

OPERATION DIAGRAM





SM 180
No
adjustment

SM 180

- * Relay for phase angle errors above 15° and for phase breaking.
- * Operates regardless of phase sequence.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * Supply voltage is the 3-phased measuring voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Inputs

Pins 5 - 6 and 7.

Measuring voltage - Supply voltage

$3 \times 220 \text{ VAC}$
 $3 \times 380 \text{ VAC}$ } $\pm 10\%$

Available for $3 \times 415 \text{ VAC}$ upon request.

The measuring voltage also works as supply voltage. The phase sequence of the voltage is arbitrary. (L1-L2-L3) or (L1-L3-L2).

Frequency

50 Hz or 60 Hz.

Phase angle sensitivity

$15^\circ \pm 10\%$.

Factory set.

Amplitude sensitivity

$\pm 30\%$.

Hysteresis

Approx. 5° .

Reaction time for phase angle errors

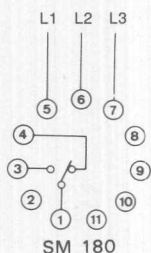
1 s.

Is available on request with other reaction times up to 4 s.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAM



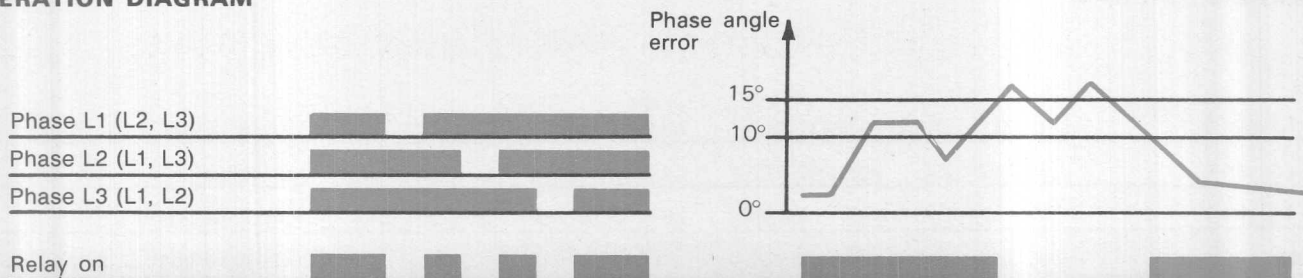
MODE OF OPERATION

The relay operates - regardless of the phase sequence - if the phase angle error is less than 15° .

The relay releases within 1 second in case of interruption of one of the phase lines, provided that the phase angle error between a phase regenerated by interconnected electric motors and the non-interrupted phases exceeds 15° .

Even if the phase angle error does not exceed 15° the relay shall release in case of phase breaking, provided that the voltage regenerated is below 70 % of the nominal voltage.

OPERATION DIAGRAM





SM 190
No
adjustment

SM 190

- * Phase sequence/Phase breaking relay.
- * Measures on current in conjunction with 3-phased current metering transformers.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * Supply voltage single phased AC.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Inputs

Pins 5 - 6 and 7.

Measuring range

In conjunction with 3-phased current metering transformers type MI 3050 or type MI 3500 phase sequence/phase breaking can be detected between 1-500 amp. in 2 measuring ranges:

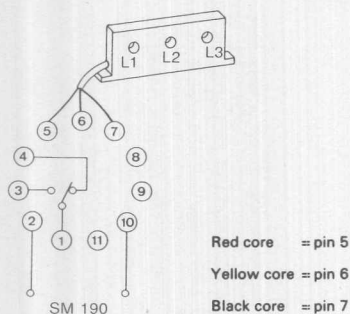
1- 50 amp.
1-500 amp.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Current metering transformers, type MI 3050 and type MI 3500.
See catalogue on accessories.

WIRING DIAGRAM



MODE OF OPERATION

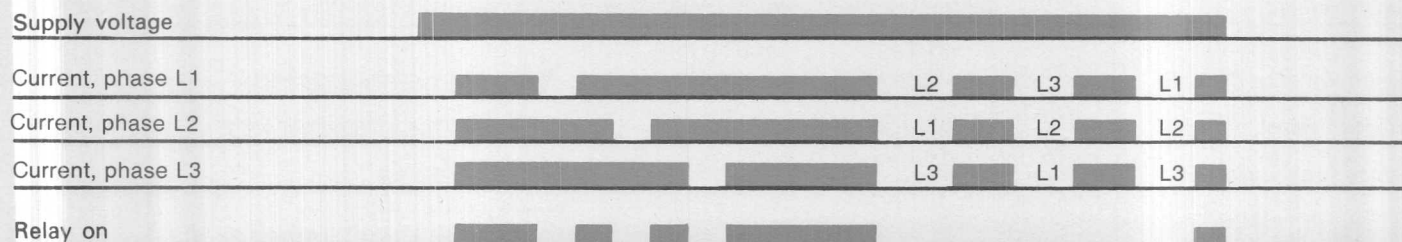
The relay is used in conjunction with one of the current metering transformers MI 3050 or MI 3500. The relay operates provided the phase sequence is correct and the current flowing in each phase is in excess of 1 amp.

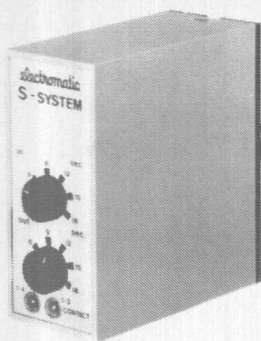
The cables of the 3-phase load must be led from the same side of the transformer and through the appropriate holes.

If the relay fails to operate when current is flowing, two of the lines passing through the current metering transformer must be interchanged in order to establish correct phase sequence. The relay, supervising that current is flowing in all 3 phases, releases in case of phase breaking, regardless of the voltage regenerated in the interrupted phase by interconnected electric motors.

Note: If the current consumption is less than 1 A, for instance 0.5 or 0.2 A, the relay can still be applied, provided that the phase lines are drawn 2 or 5 times respectively through the holes of the current metering transformer.

OPERATION DIAGRAM





Two adjustable knobs

SO 115

- * Windmill relay for relative wind direction.
- * Operates in conjunction with opto-electronic wind vane, type OD 02.
- * Delay on yawing and time for forced yawing are separately adjusted (0.8-18 secs).
- * Input for forced yawing.
- * 10 A SPDT output relay with neutral centre position.
- * LED-indication of both working positions.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Control range
 $\pm 7^\circ$ from the present starting point.
 While measuring deviations from the present starting point, the S-system registers whether the wind veers or backs.

Hysteresis
 3.5° .

Delay on yawing
 The delay period is set by a built-in potentiometer (0.8 to 18 secs), and the timing starts

when a change of wind has caused a deflection of more than 7° compared to the present position of the top of the windmill. If the wind returns to its starting point $\pm 7^\circ$ before the set time has elapsed, the timing is reset.

Forced yawing
 On connection between pins 7 and 9 the relay operates (pins 1-3), and the motor that turns the top of the windmill is activated. The motor works as long as pin 7 is connected with pin 9, through maximum during the set period. Adjustment on built-

in potentiometer (0.8-18 secs) dependent on the time required for the motor to yaw the top of the windmill e.g. 90° .

Adjustment
 2 potentiometers with absolute scales:
 0.8 to 18 seconds.

Upper knob: Adjustment of delay on yawing.
 Lower knob: Adjustment of forced yawing.

Signal generator
 Opto-electronic wind vane type OD 02. Supply voltage from the SO 115.

Inputs for OD 02

Pin 5: Centre signal.
 Pin 6: + 24 VDC.
 Pin 7: Negative.
 Pin 8: Signal for direction of deflection (left/right).

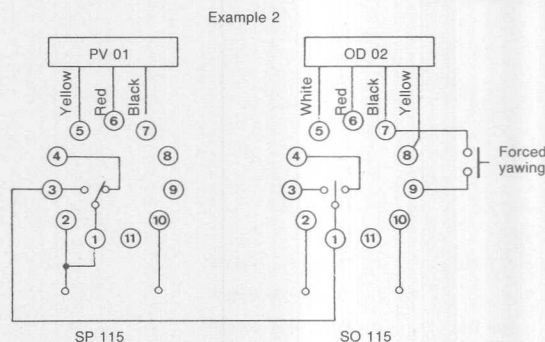
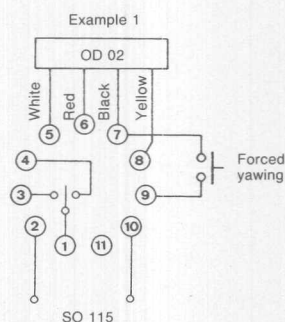
Accessories

Bases.
 Hold down spring.
 Mounting rack.
 Base covers.
 Front mounting bezel.

Opto-electronic wind vane, type OD 02.

See catalogue on accessories.

WIRING DIAGRAMS



MODE OF OPERATION

S-system, type SO 115 is used in conjunction with wind vane, type OD 02 for automatic control of the yawing of windmills. SO 115 incorporates a relay with neutral centre position. In this position the top of the windmill is kept still, while the two working positions cause a turning either to the right or to the left of the windmill. In order to avoid incessant turning of the top of the windmill at changing directions of the wind, the S-system incorporates adjustable delay on yawing (upper knob). The SO 115 also has a built-in potentiometer (lower knob) for adjustment of yawing time (equal-

ling a turning of the top of the windmill of e.g. 90°) in case of error in conditions.

If the position of a windmill deviates 180° from the wind direction on starting, it may be necessary to force the start of the yawing by connecting pin 7 with pin 9 until the windmill stands app. 45° towards the wind direction.

Example 1

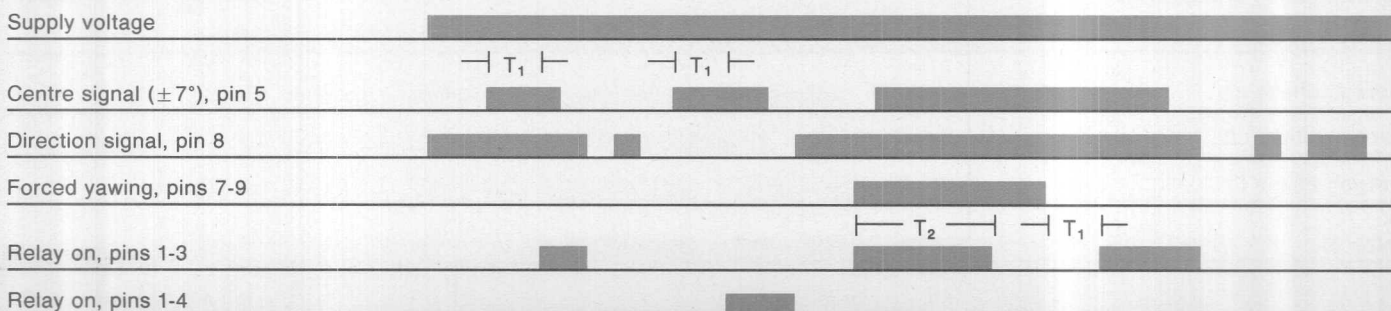
At a change of the wind in excess of 7° , the set delay period starts. When the wind vane has had a constant deflection of more than 7° for the set time, the relay operates, thus causing the top of the windmill to turn towards the new wind direction.

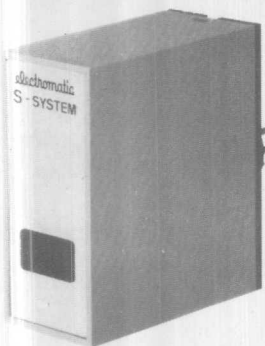
Example 2

As example 1 but here wind velocity relay, type SP 115 and anemometer, type PV 01 are connected too. A deflection of the wind vane requires a certain minimum velocity of wind (app. 2 metres/sec), and this example shows how incessant yawing in calm can be avoided. The required minimum wind speed is adjusted on S-system, type SP 115. See descriptions on SP 115/PV 01.

Other S-systems which are applicable for the control of wind-driven generators (windmills) are the SF 140 and SF 160.

OPERATION DIAGRAM





SP 042
No adjustment

SP 042

- * 3-digit pulse counter with LED display, 30/1000 Hz.
- * Input signal either from metallic contact, sensor with amplifier (24 VDC), or NPN output transistor with open collector.
- * Reset by metallic contact or NPN output transistor with open collector. Can also be reset by interruption of the supply voltage.
- * Compatible with pre-selection relay type SP 149.
- * No adjustment.
- * No output relay.
- * AC or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Inputs

CONTACT INPUT:

Connected to pins 7 and 9.

Pin 9 positive: 8 VDC.

Contact resistance:

Maximum 1 K Ω .

Frequency: Maximum 30 Hz.

TRANSISTOR INPUT:

NPN output transistor with open collector can be connected to pins 7 and 8.

Pin 8 positive: 8 VDC.

Frequency: Maximum 1000 Hz.

INPUT FOR SENSOR with built-in amplifier (24 VDC):

Connected to pins 6, 7 and 8.

Pin 6 positive: 24 VDC.

Red core (+) to pin 6 on the relay.

Black (-) to pin 7.

Yellow (output) to pin 8.

Frequency: Maximum 1000 Hz.

Reset

Internal reset by interruption of the supply voltage for minimum 100 ms.

External reset by connecting pins 5 and 7 either to a metallic contact or a NPN output transistor with open collector.

Pin 5 positive: 8 VDC.

Contact resistance:

Maximum 1 K Ω .

Pulse duration:

Minimum 20 ms.

If a sensor with built-in amplifier is used for reset pulses, it is connected to pin 6 (internal voltage), provided that this pin is not already occupied for counting pulses. In that case an external power supply (24 VDC) has to be applied.

Display

3-digit, 7-segment LED display.

Height of digits: 3 mm.

Frontplate of the display made of polycarbonate.

Accessories

Bases.

Hold down spring.

Mounting rack.

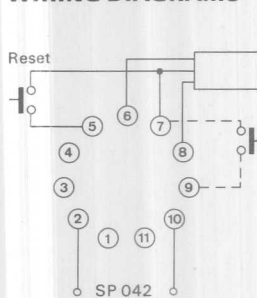
Base covers.

Front mounting bezel.

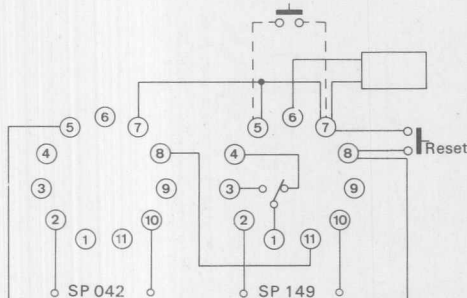
Inductive, capacitive, or optical proximity sensors with NPN transistor output.

See catalogue on accessories.

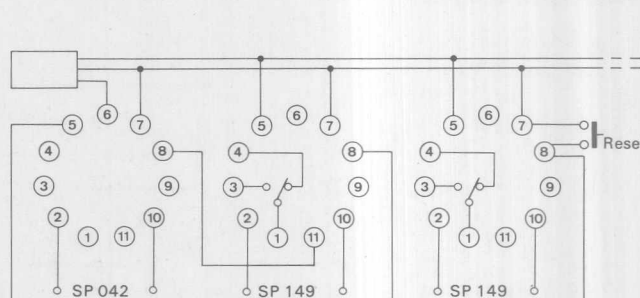
WIRING DIAGRAMS



Example 1



Example 2



Example 3

MODE OF OPERATION

3-digit, 30/1000 Hz, pulse counter with LED display.

The counter can be used in conjunction with one or more pre-selection relays type SP 149. The maximum permissible counting speed is 30 Hz, when the SP 042 is connected to the SP 149. The signal input terminals can be connected either to a metallic contact (maximum 30 Hz), a NPN output transistor with open collector, or a sensor with built-in amplifier (24 VDC). At electronic triggering, the maximum counting speed is 1000 Hz. The counter can be reset either by the same units as mentioned above, or by interruption of the supply voltage for minimum 100 ms.

The counter delivers the required voltage for both counting and reset pulses.

Example 1

The SP 042 here works as a counting unit connected to a sensor with built-in amplifier (24 VDC). Reset pulse to pins 5 and 7.

The stippled line indicates input signal from metallic contact.

Example 2

Coupling between the SP 042 and one pre-selection relay type SP 149. Input signals from sensor without amplifier (NAMUR), or metallic contact (stippled line).

Joint or separate reset of the SP 042 and SP 149.

The number of input pulses can be read out on the display of the SP 042, while the output relay of the SP 149 operates, when the pre-selected number of pulses is reached.

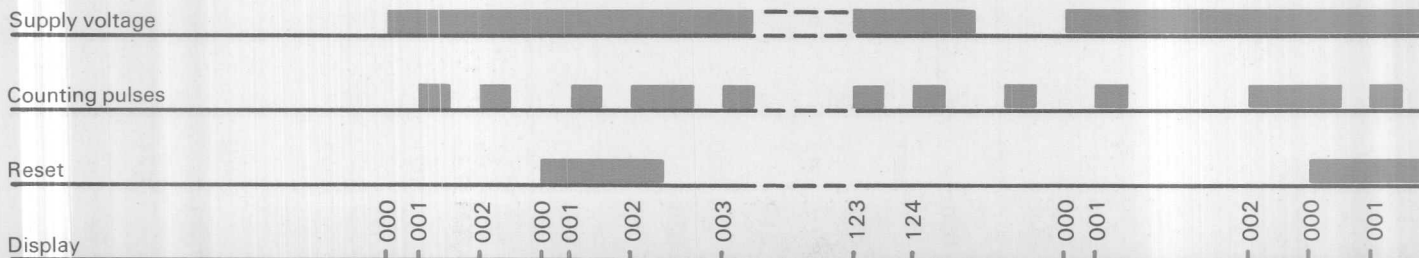
Example 3

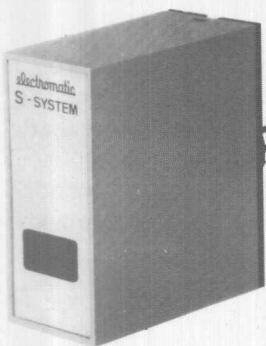
Coupling between the SP 042 and more pre-selection relays type SP 149.

Input signals from sensor with built-in amplifier (24 VDC). Joint or separate reset of the SP 042 and SP 149's.

The number of input pulses can be read out on the display of the SP 042, while the output relays of the SP 149 pre-selection relays operate, when the individually pre-selected numbers of pulses have been received.

OPERATION DIAGRAM





SP 052
No adjustment

SP 052

- * 3-digit pulse/period counter with LED display, 30/1000 Hz.
- * Counting inputs either for metallic contact, sensor with built-in amplifier (24 VDC), or NPN output transistor with open collector.
- * Input for strobe pulses from metallic contact or NPN output transistor with open collector.
- * No adjustment.
- * No output relay.
- * AC or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key Pages 10-12.

Inputs for counting pulses

CONTACT INPUT:

Connected to pins 7 and 9.

Pin 9 positive: 8 VDC.

Contact resistance:

Maximum 1 K Ω .

Frequency: Maximum 30 Hz.

TRANSISTOR INPUT:

NPN output transistor with open collector can be connected to pins 7 and 8.

Pin 8 positive: 8 VDC.

Frequency: Maximum 1000 Hz.

INPUT for SENSOR with built-in amplifier (24 VDC):

Connected to pins 6, 7 and 8.

Pin 6 positive: 24 VDC.

Red core (+) to pin 6 on the relay.

Black (-) to pin 7.

Yellow (output) to pin 8.

Frequency: Maximum 1000 Hz.

Inputs for strobe pulses

Registration of strobe pulses when pins 5 and 7 are connected either to a metallic contact, or to an NPN output transistor with open collector.

Pin 5 positive: 8 VDC.

Contact resistance:

Maximum 1 K Ω .

Pulse duration:

Minimum 20 ms.

If a sensor with built-in amplifier is used for strobe pulses, it has to be connected to pin 6 (internal voltage), provided that this pin is not already occupied for counting pulses. In that case an external power supply (24 VDC) has to be applied.

Display

3-digit, 7-segment LED display.

Height of digits: 3 mm.

Frontplate of the display made of polycarbonate.

Accessories

Bases.

Hold down spring.

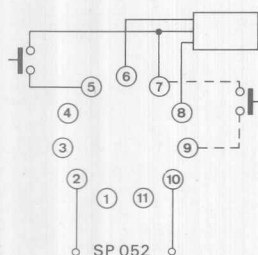
Mounting rack.

Base covers.

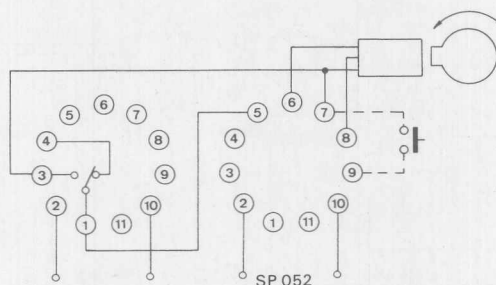
Front mounting bezel.

Inductive, capacitive, or optical proximity sensors with NPN transistor output.
See catalogue on accessories.

WIRING DIAGRAMS



Example 1



Recycler type SC

Example 2

MODE OF OPERATION

3-digit, 30/1000 Hz, pulse/period counter with 7-segment display and inputs for counting and strobe pulses. The counter delivers the required voltage for the pulses.

The registered number of counting pulses between two strobe pulses (read out/reset pulses) are shown on the display.

As an example the counting pulses can express the number of revolutions of a screw conveyor. The figures on the display thus equals quantity per time unit.

At appropriate setting of the distance between the strobe pulses, e.g. originating from a recycler type SC, it is possible to read out the flow velocity (kg per minute, cubic content per hour, etc.).

The strobe pulses can either originate from a metallic contact or a NPN output transistor with open collector. Minimum pulse duration 20 ms.

The counting pulses can originate either from a metallic contact (maximum 30 Hz), from a proximity sensor with built-in amplifier (24 VDC), or from an NPN output transistor with open collector. The maximum frequency is 1000 Hz when electronic triggering.

Each time the SP 052 receives a strobe pulse, the number of counting pulses is transferred to the display, the counter is reset, and a new counting period starts.

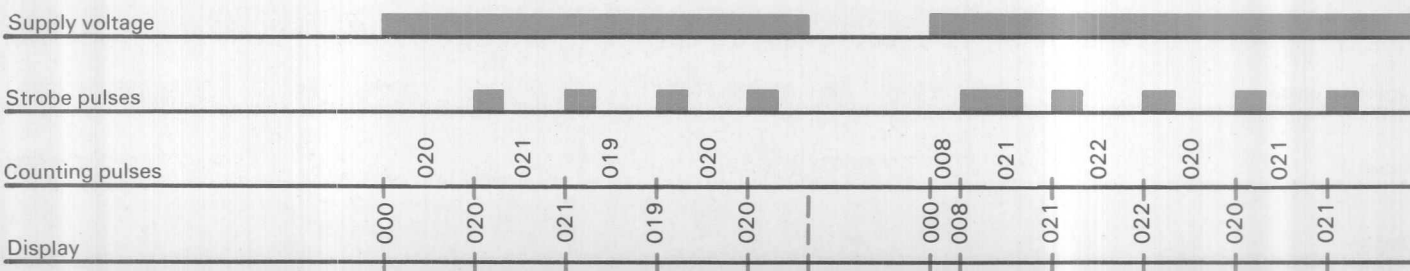
Example 1

A metallic contact is connected to the input terminals for strobe pulses (pins 5 and 7) of the SP 052. The counting input is activated by a proximity sensor with built-in amplifier (24 VDC). The stippled line indicates connection for counting pulses from a metallic contact (pins 7 and 9).

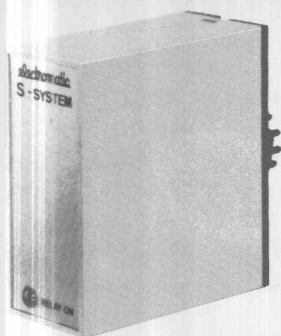
Example 2

Same mode of operation as mentioned in example 1; here, however, the metallic contact, connected to the strobe input terminals, is shown as a recycler type SC in the S-system.

OPERATION DIAGRAM



SP 100/105



SP 100
External
resistor adjustable



SP 105
Knob-adjustable

- * Pulse-continuity relay.
- * Automatic start at applied supply voltage.
- * Controlled by metallic contact, inductive sensor, capacitive sensor or NPN-transistor.
- * Time range up to 600 s.
- * Adjustment of time either by knob or external time resistor.
- * Repeatability: $\pm 1\%$.
- * Connection for Digital Timer Control.
- * 10 A SPDT output relay.
- * LED-indication of relay position.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Time ranges

0.15 - 3 s
0.8 - 18 s
3 - 60 s
8 - 180 s
30 - 600 s.

Range accuracy

+ 5% on max.
- 10% on min.

Repeatability

$\pm 1\%$.

Max. time variation

Within the limits of rated supply voltage and ambient temperature: $\pm 2\%$.

Reset of time

MECHANICAL TRIGGERING:

Pins 5 and 11 interconnected with metallic contact.
2 to 5 VDC - 3 mA.

Pin 5 positive.

Pulse duration: Min. 25 ms.

TRANSISTOR TRIGGERING:

Pins 5 and 11 connected with a pulse generator with NPN-transistor (open collector).
Emitter is connected to pin 11.

2 to 5 VDC - 3 mA.

Pin 5 positive.

Pulse duration: Min. 25 ms.

ELECTRONIC TRIGGERING:

When an inductive sensor type DU, DJ, DO, or a capacitive

sensor type DR connected between pins 6 and 7, is actuated.

8 VDC - 15 mA.

Pin 6 positive.

Pulse duration: Min. 20 ms.

Adjustment of SP 100

External resistor or remote potentiometer R_T .
0 - 1 M Ω , 0.25 W.

The external resistor must be mounted before the S-system will work.

Adjustment of SP 105

Knob-adjustable with scale in seconds.

Setting accuracy: $\pm 10\%$.

Accessories

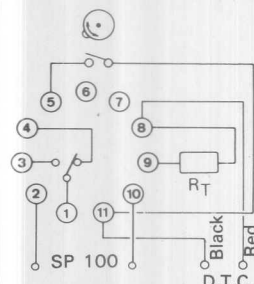
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.
Remote potentiometer kit.
Inductive sensors type DU, DJ or DO.
Capacitive sensors type DR.
Mounting bracket type DB 1.

Digital Timer Control

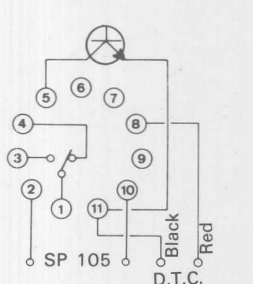
Connection for Digital Timer Control (D.T.C.) between pins 8 and 11.
Pin 8 positive.

See catalogue on accessories.

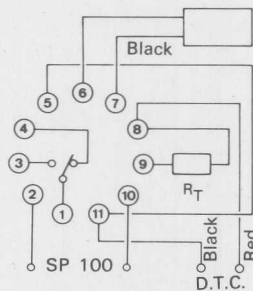
WIRING DIAGRAMS



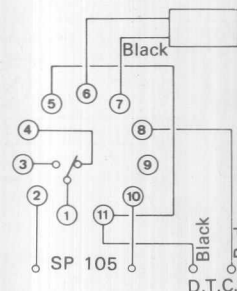
Mechanical triggering
with metallic make contact



Pulse generator trigger with
transistor output



Electronic triggering
with inductive or capacitive sensor



MODE OF OPERATION

This pulse-continuity relay is controlled either by metallic contacts, inductive sensors, capacitive sensors, or NPN-transistors.

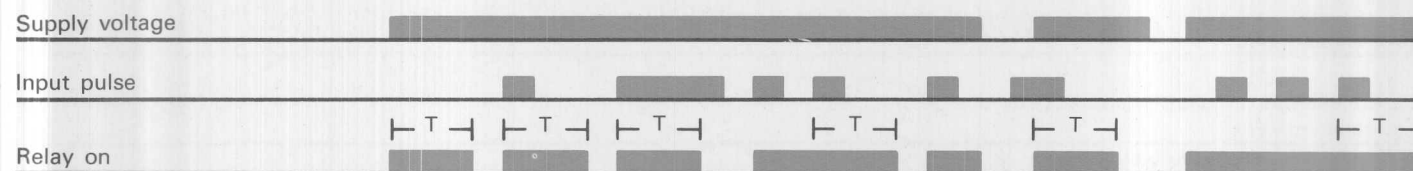
At connection of the supply voltage the relay will immediately operate¹⁾, and it is released when the set time has expired. When a pulse is received after expiration of the set time, the relay operates again, and a new period starts from the front edge of the pulse.

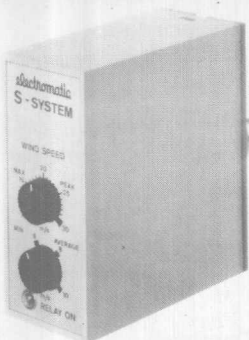
If one or more pulses is supplied before expiration of the set time the relay remains in operating position, as a new full period always starts from the front edge of the latest pulse being registered. If the time interval between 2 pulses exceeds the set time, the relay releases, and e.g. thus causing an alarm to start.

Typical applications: Controlling that a piston actually is moving, that objects on an assembly line are conveyed properly and without heaping up, or that a periodic control is accomplished with the prescribed intervals. When the supply voltage is interrupted the relay releases, and the time is reset to zero.

¹⁾ Another pulse-continuity relay, SM 100/105, remains deenergized, until receipt of the first triggerpulse (front edge of pulse).

OPERATION DIAGRAM





SP 115
Two adjustable
knobs

SP 115

- * Wind velocity relay with outputs for instruments.
- * Measuring range: 2 - 30 m/s in conjunction with opto-electronic pulse generator type PV 01.
- * The relay operates, when the velocity of the wind has been within the set limits for 10 minutes.
- * The relay releases instantly when one of the limits is exceeded.
- * 10 A SPDT output relay.
- * LED-indication of relay position.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Measuring range
2 - 30 m/s.

Hysteresis
1 m/s within the range.

Delay on operate
During normal operation pins 7 and 11 are interconnected which causes a delay of 10 minutes. During adjustment the delay can be reduced to 20 seconds by interrupting the interconnection between pins 7 and 11.

Measuring voltage
Pins 6 and 7: 24 VDC.
Pin 6 positive.

Adjustment
2 built-in potentiometers with absolute scales in m/s (metres per second).

Upper knob: Maximum value from 10 to 30 m/s.
Lower knob: Minimum value from 2 to 10 m/s.

Pulse generator (anemometer)
Rotating opto-electronic pulse generator, type PV 01. Supply voltage from the SP 115.

Inputs for pulse generator type PV 01
Pins 5, 6 and 7.
Pin 6 positive.
Pin 5 (yellow): Signal input.
Pin 6 (red): +24 VDC.
Pin 7 (black): -

Connection for instruments
Connection for 2 moving-coil instruments with full scale deflection 1 mA. Nominal internal resistance 300 Ω .

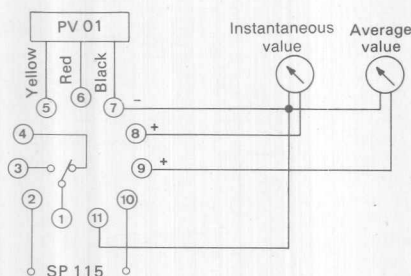
Instantaneous value: Pins 7-8
Average value: Pins 7-9
Pin 7: Common negative.

Accessories
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Opto-electronic pulse generator (anemometer) type PV 01.
Moving-coil instruments type ID 270 with scales calibrated to 0-30 m/s.

See catalogue on accessories.

WIRING DIAGRAM



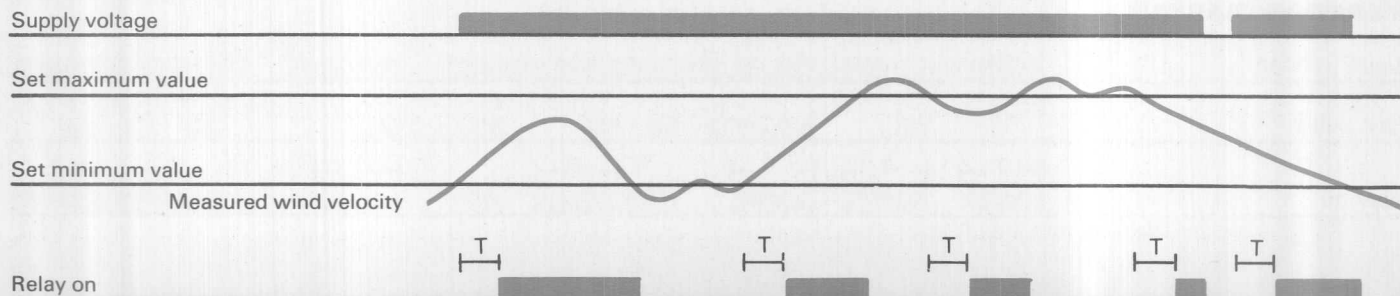
MODE OF OPERATION

In conjunction with an anemometer, type PV 01 being an opto-electronic pulse generator, the wind velocity relay, type SP 115 can be used for remote display of velocities up to 30 m/s (equalling 67 miles/h). Instantaneous value and average value of the wind velocity can be displayed on two moving-coil instruments with a full-scale deflection of 1 mA.
The SP 115 has a minimum scale (2 to 10 m/s) and a maximum scale (10 to 30 m/s). Average value is measured in the minimum range, and instantaneous value in the maximum range.

The relay operates, when the velocity of the wind has been within the set minimum and maximum limits for 10 minutes. The relay releases instantly when one of the limits is exceeded. The relay will not operate again, until the wind speed has been within the set limits for 10 minutes.

This mode of operation is applicable for the avoidance of both commuting and overloading of wind-driven generators (windmills). Other S-systems which are applicable for the control of wind-driven generators (windmills) are the SF 140 and SF 160.

OPERATION DIAGRAM





SP 129/229
Digital setting

SP 129/229

- * Pulse dividing relay, 2-digit.
- * Digital setting of trip point from 2 to 99 pulses.
- * Controlled by metallic contact, inductive sensor, capacitive sensor or NPN-transistor.
- * Supply voltage to pulse generator (max. 10 VDC) from the S-system.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication both for relay and pulse.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Number of pulses
2 - 99.

Adjustment
Digital setting of trip point.

Input
Pins 5 - 7.
Pin 7 negative.

Pins 6 - 7.
Pin 7 negative.
(Pins 5 - 7 interconnected).

Measuring voltage
Max. 10 VDC.

Short-circuit current
Max. 1.0 mA.

Pulse duration - input
15 ms - ∞.

Pulse interval - input
15 ms - ∞.

Counting speed
Max. 33 pulses/s.

Output frequency, relay
Max. 5 pulses/s.

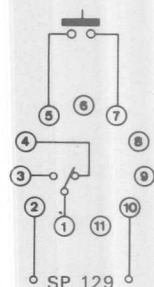
Reset to 1
At first pulse after the set number of pulses.

Reset to 0
By disconnecting the supply voltage for min. 0.6 s.

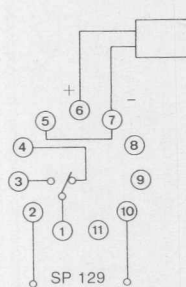
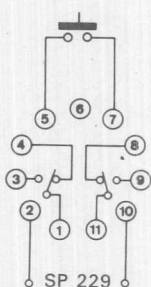
Accessories
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Inductive sensors without amplifier (NAMUR), type DU, DJ or DO.
Capacitive sensors without amplifier (NAMUR), type DR.
See catalogue on accessories.

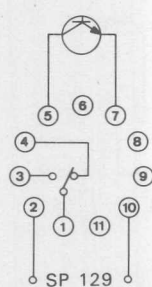
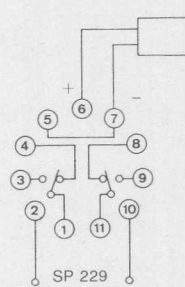
WIRING DIAGRAMS



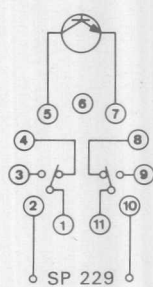
Mechanical triggering
with metallic contact



Electronic triggering with
inductive or capacitive sensor



Pulse generator trigger
with transistor output



MODE OF OPERATION

Pulse dividing relay adjustable between 2 and 99 pulses by means of 2 digital switches.

The relay operates when the set number of pulses has been received (front edge of last pulse).

The relay releases when the next pulse has been received (front edge of the pulse), or when the supply voltage is disconnected.

The pulse generator can either be an ordinary make contact, e.g. a limit switch, an inductive sensor, a capacitive sensor, or a NPN-transistor with open collector. The emitter is connected to pin 7.

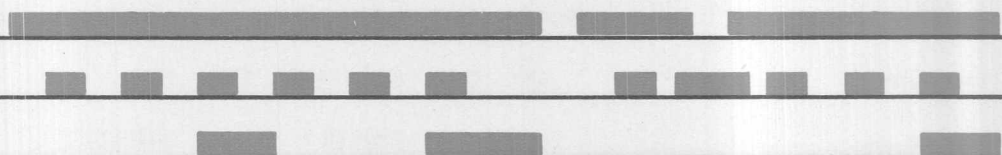
OPERATION DIAGRAM

Pre-selection of 3 pulses.

Supply voltage

Input pulse

Relay on





SP 139/239
Digital setting

SP 139/239

- * Pulse dividing relay, 3-digit.
- * Digital setting of trip point from 2 to 999 pulses.
- * Controlled by metallic contact, inductive sensor, capacitive sensor or NPN-transistor.
- * Supply voltage to pulse generator (max. 10 VDC) from the S-system.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication both for relay and pulse.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Number of pulses
2 - 999.

Adjustment
Digital setting of trip point.

Input
Pins 5 - 7.
Pin 7 negative.

Pins 6 - 7.
Pin 7 negative.
(Pins 5 - 7 interconnected).

Measuring voltage
Max. 10 VDC.

Short-circuit current
Max. 1.0 mA.

Pulse duration - input
15 ms - ∞.

Pulse interval - input
15 ms - ∞.

Counting speed
Max. 33 pulses/s.

Output frequency, relay
Max. 5 pulses/s.

Reset to 1
At first pulse after the set number of pulses.

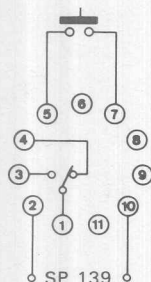
Reset to 0
By disconnecting the supply voltage for min. 0.6 s.

Accessories

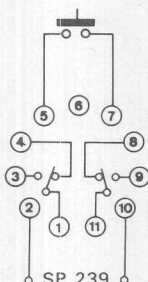
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Inductive sensors without amplifier (NAMUR), type DU, DJ or DO.
Capacitive sensors without amplifier (NAMUR), type DR.
See catalogue on accessories.

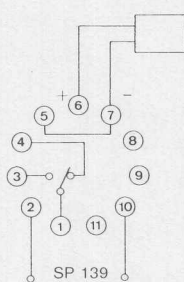
WIRING DIAGRAMS



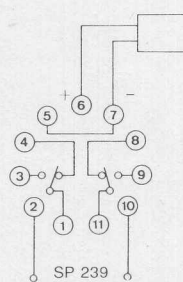
Mechanical triggering
with metallic contact



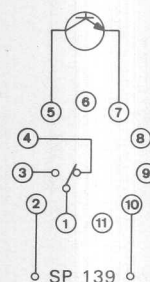
SP 239



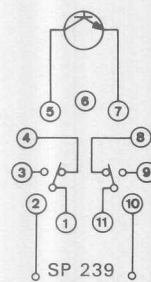
Electronic triggering with
inductive or capacitive sensor



SP 239



Pulse generator trigger
with transistor output



SP 239

MODE OF OPERATION

Pulse dividing relay adjustable between 2 and 999 pulses by means of 3 digital switches.

The relay operates when the set number of pulses has been received (front edge of last pulse).

The relay releases when the next pulse has been received (front edge of the pulse), or when the supply voltage is disconnected.

The pulse generator can either be an ordinary make contact, e.g. a limit switch, an inductive sensor, a capacitive sensor, or a NPN-transistor with open collector.

The emitter is connected to pin 7.

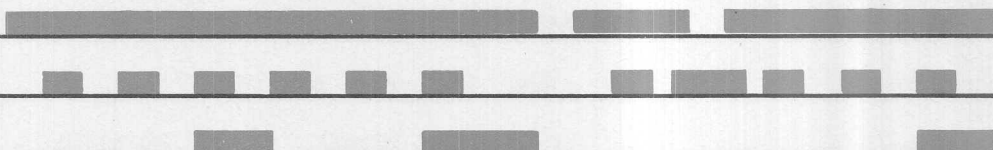
OPERATION DIAGRAM

Pre-selection of 3 pulses.

Supply voltage

Input pulse

Relay on





SP 149
Digital setting

SP 149

- * Pre-selection relay, 3-digit.
- * Digital setting between 2 and 999 pulses.
- * Input signals either from metallic contact, proximity sensor (NAMUR), or NPN output transistor.
- * Reset input for metallic contact or NPN output transistor with open collector.
- * Compatible with pulse counter type SP 042.
- * Inversion of relay function possible.
- * 10 A SPDT output relay.
- * LED-indication both for relay and pulse.
- * AC or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Number of pulses

2 to 999 pulses.

Setting

Digital setting of trip point.

Counting speed

Maximum 30 pulses/s.

Inputs

CONTACT INPUT:
Connected to pins 5 and 7.
Pin 5 positive: 8 VDC.
Contact resistance:
Maximum 1 K Ω .

TRANSISTOR INPUT:
NPN output transistor with open collector can be connected to pins 5 and 7.
Pin 5 positive: 8 VDC.

INPUT for SENSOR (NAMUR):
Connected to pins 6 and 7.
Pin 6 positive: 8 VDC.
Pins 5 and 7 must be interconnected.

Reset

Internal reset by interrupting the supply voltage for minimum 400 ms.

External reset by connecting pins 7 and 8 either to a metallic contact or an NPN output transistor with open collector.
Pin 8 positive: 8 VDC.
Contact resistance:
Maximum 1 K Ω .
Reset time: Minimum 20 ms.

Inversion

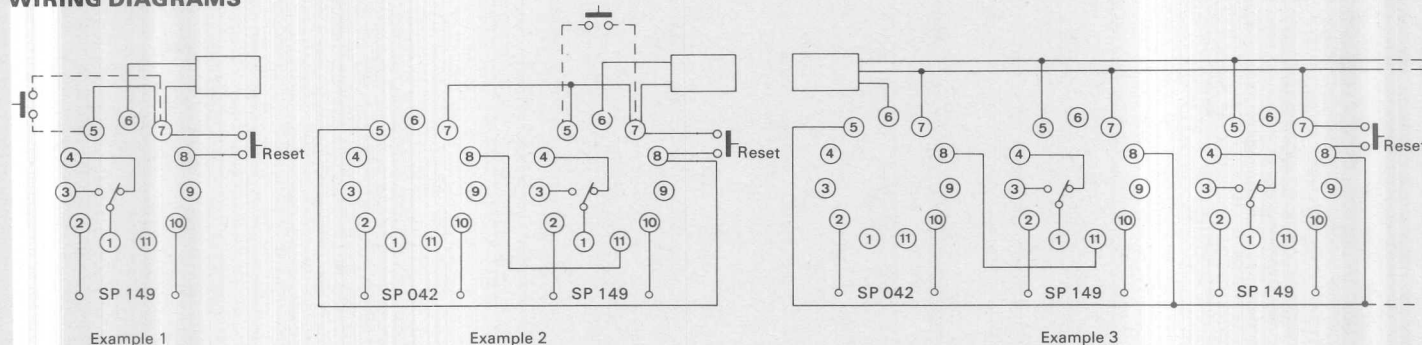
The function of the relay can be inverted by interconnecting pins 7 and 9.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Inductive and capacitive sensors without amplifier (NAMUR).
See catalogue on accessories.

WIRING DIAGRAMS



MODE OF OPERATION

3-digit, 30 Hz, pre-selection counter with output relay. Setting between 2 and 999 pulses on 3 digital switches. One or more pre-selection relays type SP 149 can be used in conjunction with one or more pulse counters type SP 042 where the arrived number of pulses can be read out on a LED display. The pre-selection relay can be triggered either by a metallic contact, a NPN output transistor with open collector, or a proximity sensor in NAMUR design. In the latter case, only one SP 042 can be connected to the SP 149. The counting unit and the output relay are reset together.

The pre-selection relay delivers the required voltage for both counting and reset pulses.

Example 1

The signal input terminals are here connected to a proximity sensor in NAMUR design (interconnection of pins 5 and 7). The stippled line indicates connection from signal input terminals to a metallic contact. The relay operates, when the set number of pulses has been reached. The relay releases either on receiving an external reset pulse, or when the supply voltage is interrupted.

Example 2

Coupling between pre-selection relay type

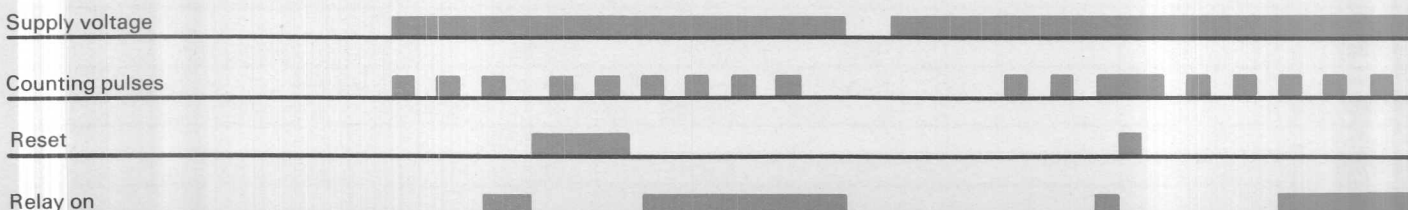
SP 149 and pulse counter type SP 042. Input signals from NAMUR sensor or contact. Joint or separate reset of SP 149 and SP 042.

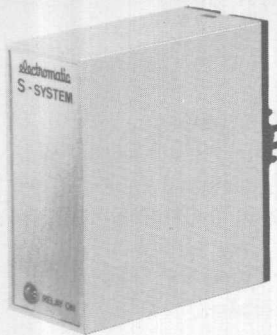
Example 3

Coupling between one pulse counter SP 042 and more pre-selection relays SP 149. Input signals from sensor with built-in amplifier (24 VDC). Joint or separate reset of the SP 042 and SP 149. The number of input pulses can be read out on the display of the SP 042, while the output relays of the SP 149 pre-selection relays operate, when the individually pre-selected numbers of pulses have been received.

OPERATION DIAGRAM

Pre-selection of 3 pulses





SR 110
No adjustment

SR 110

- * Coincidence relay.
- * 10 A SPDT output relay.
- * LED-indication of relay position.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10–12.

Output frequency
Max. 10 pulses/s.

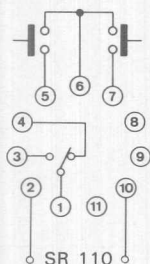
Contact voltage
Max. 24 VDC.
From the S-system.
Pin 6 positive.

Short-circuit current
Max. 100 mA.

Connection cable
Can be extended as wanted,
however resistance:
Max. 100 Ω .

Accessories
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAM



MODE OF OPERATION

The relay is installed with 2 external make contacts, which both have to be actuated within 0.5 s in order to make the relay operate.

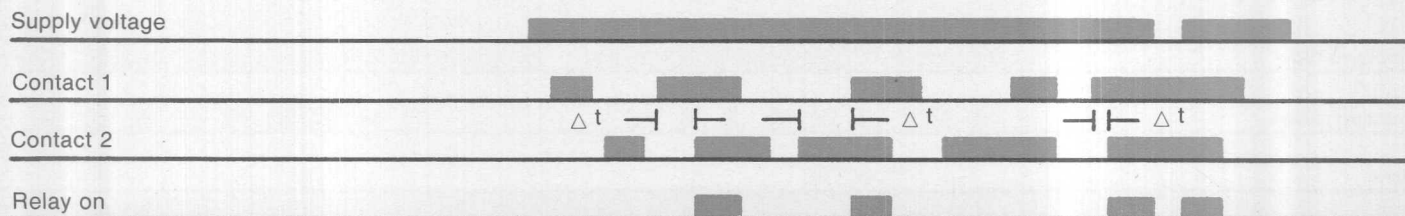
If one of the contacts is interrupted, the relay will immediately release.

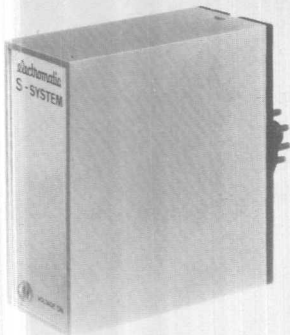
The relay will not operate again, till the other contact is also interrupted and both contacts are reactivated within 0.5 s.

If both contacts are already closed when the supply voltage is connected, the relay will immediately operate.

Time differences shorter than 0.5 s in the operation diagram is shown by Δt .

OPERATION DIAGRAM





ST 010
No adjustment

ST 010

- * Amplifier for temperature sensors type ETR.
- * Connection for moving-coil instrument.
- * Metering range: - 20 to + 120°C, divided into 5 sub-ranges.
- * No adjustment possible.
- * Without output relay.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Temperature ranges

- 20 to + 10°C
0 to + 30°C
+ 20 to + 80°C
+ 60 to + 120°C
0 to + 100°C.

Metering voltage

Pins 5 and 7: 2 VDC.
Pin 5 positive.

Connection cable

2-core, normally unscreened.
Screen, if any, to pin 7.
Length as desired.
Error per 6 Ω cable resistance:
App. + 1°C.

Instrument connection

Pins 7 and 11.
Pin 11 positive.
Connection for moving-coil instrument, internal resistance 110 Ω, 1 mA full scale deflection, e.g. type ID 120.

Slave coupler

Up to 5 ST 010 amplifiers (with different scale ranges if wanted) can be slave coupled in conjunction with one ETR sensor and one ST 010 (master) amplifier as shown below (example 2).
All coupling combinations of ST 010, ST 115 and ST 185 are possible.

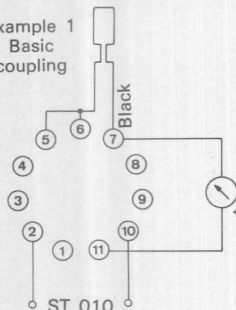
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

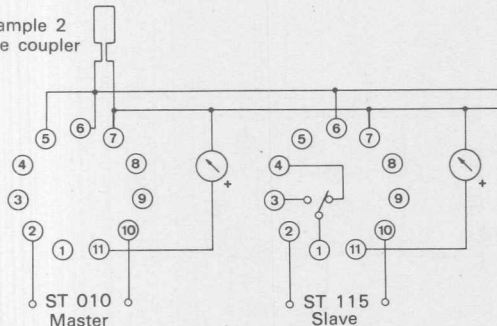
Moving-coil instrument, type ID 120.
Temperature sensors, type ETR.
See catalogue on accessories.

WIRING DIAGRAMS

Example 1
Basic coupling



Example 2
Slave coupler

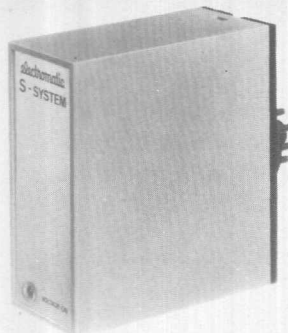


MODE OF OPERATION

Electronic thermometer amplifier without output relay.
A moving-coil instrument with 1 mA full scale deflection and a scale calibrated in temperature degrees can be connected to the amplifier in order to visualize the temperatures measured.

The amplifier generates a voltage of max. 8.2 V on the instrument terminals (pins 7-11) over an internal resistance of 8.2 KΩ. The moving-coil instrument ideally has 110 Ω internal resistance. A deviation of ± 100 Ω is however not critical as it shall cause false readings as small as ± 1 %.

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$



ST 020
No adjustment

ST 020

- * Amplifier for standard temperature sensors type Pt 100 (DIN 43760).
- * Connection for moving-coil instrument.
- * Metering range: - 50 to + 850°C, divided into 10 sub-ranges.
- * No adjustment possible.
- * Without output relay.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Temperature ranges

- 50 to + 50°C
- 0 to + 100°C
- + 100 to + 200°C
- + 200 to + 300°C
- + 300 to + 400°C
- + 400 to + 500°C
- + 500 to + 600°C
- + 600 to + 700°C
- + 700 to + 800°C
- + 750 to + 850°C.

Metering voltage

Pins 5 and 7: 9 VDC.
Pin 5 positive.

Connection cable

2-core, normally unscreened. Screen, if any, to pin 7. The amplifier is adapted to 3 metres, 2 x 0.75 mm² connection cable. Can be extended if necessary. Error per 0.3 Ω cable resistance:
App. + 1°C.

Instrument connection

Pins 7 and 11.
Pin 11 positive.
Connection for moving-coil instrument, internal resistance 110 Ω, 1 mA full scale deflection, e.g. type ID 120.

Slave coupler

Up to 5 ST 020 amplifiers (with different scale ranges if wanted) can be slave coupled in conjunction with one Pt 100 sensor and one ST 020 (master) amplifier as shown below (example 2). All coupling combinations of ST 020, ST 125 and ST 199 are possible.

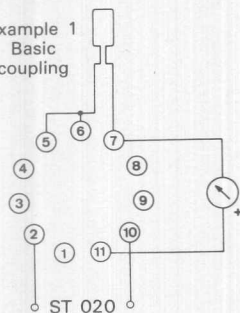
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

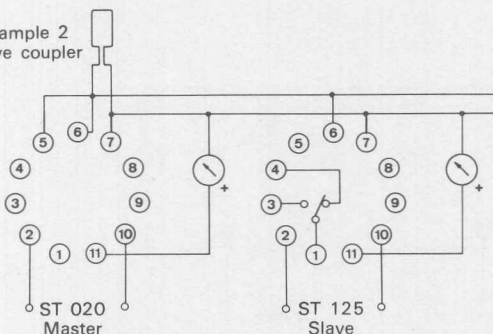
Moving-coil instrument, type ID 120.
Pt 100 standard temperature sensors.
See catalogue on accessories.

WIRING DIAGRAMS

Example 1
Basic coupling



Example 2
Slave coupler

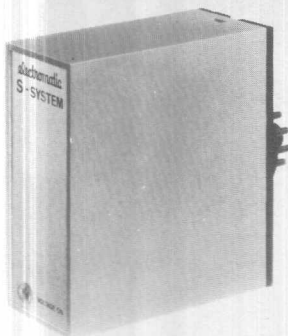


MODE OF OPERATION

Electronic thermometer amplifier without output relay.
A moving-coil instrument with 1 mA full scale deflection and a scale calibrated in temperature degrees can be connected to the amplifier in order to visualize the temperatures measured.

The amplifier generates a voltage of max. 8.2 V on the instrument terminals (pins 7-11) over an internal resistance of 8.2 KΩ. The moving-coil instrument ideally has 110 Ω internal resistance. A deviation of ± 100 Ω is however not critical as it shall cause false readings as small as ± 1 %.

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$



ST 030
No adjustment

ST 030

- * Amplifier for standard temperature sensors type Ni 100 (DIN 43760).
- * Connection for moving-coil instrument.
- * Metering range: - 60 to + 180°C, divided into 6 sub-ranges.
- * No adjustment possible.
- * Without output relay.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key Pages 10-12.

Temperature ranges

- 60 to 0°C
- 20 to + 40°C
- 0 to + 60°C
- + 40 to + 100°C
- + 80 to + 140°C
- + 120 to + 180°C.

Metering voltage

Pins 5 and 7: 2 VDC.
Pin 5 positive.

Connection cable

2-core, normally unscreened. Screen, if any, to pin 7. The amplifier is adapted to 3 metres, 2 x 0.75 mm² connection cable. Can be extended if necessary. Error per 0.5 Ω cable resistance: App. + 1°C.

Instrument connection

Pins 7 and 11.
Pin 11 positive.
Connection for moving-coil instrument, internal resistance 110 Ω, 1 mA full scale deflection, e.g. type ID 120.

Slave coupler

Up to 5 ST 030 amplifiers (with different scale ranges if wanted) can be slave coupled in conjunction with one Ni 100 sensor and one ST 030 (master) amplifier as shown below (example 2). All coupling combinations of ST 030 and ST 135 are possible.

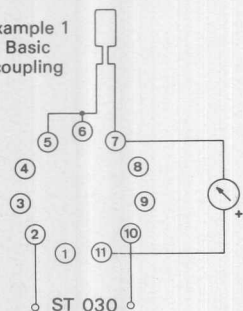
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

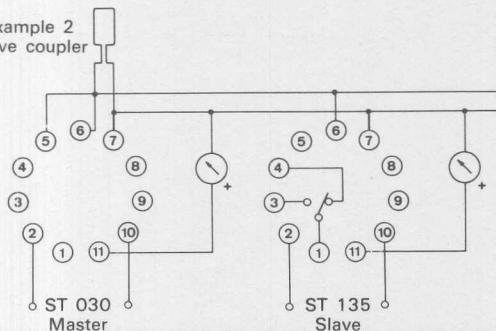
Moving-coil instrument type ID 120.
Ni 100 standard temperature sensors.
See catalogue on accessories.

WIRING DIAGRAMS

Example 1
Basic coupling



Example 2
Slave coupler

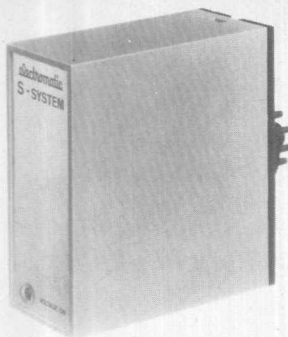


MODE OF OPERATION

Electronic thermometer amplifier without output relay. A moving-coil instrument with 1 mA full scale deflection and a scale calibrated in temperature degrees can be connected to the amplifier in order to visualize the temperatures measured.

The amplifier generates a voltage of max. 8.2 V on the instrument terminals (pins 7-11) over an internal resistance of 8.2 KΩ. The moving-coil instrument ideally has 110 Ω internal resistance. A deviation of ± 100 Ω is however not critical as it shall cause false readings as small as ± 1 %.

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$



ST 040
No adjustment

ST 040

- * Amplifier for temperature sensors, type ETS 6 - 7 - 9 - and 10.
- * Connection for moving-coil instrument.
- * Metering range: -20°C to $+120^{\circ}\text{C}$, divided in 4 sub-ranges.
- * No adjustment possible.
- * Without output relay.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Temperature ranges

- 20°C to $+10^{\circ}\text{C}$
- 0 $^{\circ}\text{C}$ to $+30^{\circ}\text{C}$
- + 20°C to $+80^{\circ}\text{C}$
- + 60°C to $+120^{\circ}\text{C}$

Metering voltage

Pins 5-6: 7 VDC.
Pins 5-8: 1 VDC.

Connection cable

Unscreened, 3-core cable.
Length as desired, however resistance: Max. 2 Ω .
Max. error with max. cable resistance: -1°C .

Instrument connection

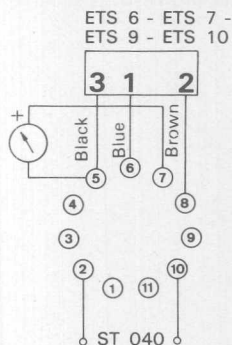
Connection for moving-coil instrument.
Full scale deflection: 1 mA.
To be connected to pins 5 and 7.
Pin 7 positive.
Pin 5 negative.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Instruments.
Temperature sensor types:
ETS 6: For liquids.
ETS 7: For gases.
ETS 9: For liquids.
With external thread: 3/8" pipe thread.
ETS 10: For measuring the temperature of a metallic surface.
See catalogue on accessories.

WIRING DIAGRAM



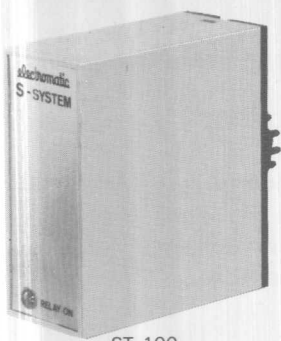
MODE OF OPERATION

Electronic thermometer amplifier without output relay.
A moving-coil instrument with 1 mA full scale deflection and a scale calibrated in temperature degrees can be connected to the amplifier in order to visualize the temperatures measured.

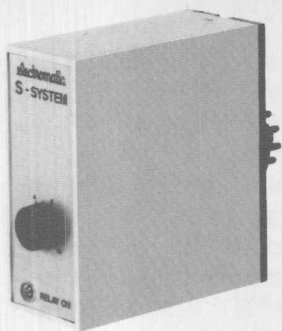
The amplifier generates a voltage of max. 8.2 V on the instrument terminals (pins 5-7) over an internal resistance of 8.2 K Ω . The moving-coil instrument ideally has 110 Ω internal resistance. A deviation of $\pm 100 \Omega$ is however not critical as it shall cause false readings as small as $\pm 1 \%$.

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

ST 100/ST 105



ST 100
External potentiometer
adjustable



ST 105
Knob-
adjustable

- * Relay for semi-conductor temperature sensors.
- * Temperature range: -20°C to $+120^{\circ}\text{C}$, divided in 4 sub-ranges.
- * Selection of 5 different types of temperature sensors.
- * Knob- or external potentiometer adjustable.
- * Connection for moving-coil instrument for temperature readings.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Adjustment ST 100

Adjustment by means of external potentiometer or the built-in potentiometer in the ETS 8 sensor
Value of external potentiometer P: 10 K Ω

Adjustment ST 105

Adjustment by means of built-in potentiometer.

Measuring range

-20°C to $+120^{\circ}\text{C}$ in 4 temperature ranges:
 -20°C to $+10^{\circ}\text{C}$
 0°C to $+30^{\circ}\text{C}$
 $+20^{\circ}\text{C}$ to $+80^{\circ}\text{C}$
 $+60^{\circ}\text{C}$ to $+120^{\circ}\text{C}$

Hysteresis

Approx. 1°C .

Measuring voltage

Pins 5-6: 7 VDC
Pins 5-8: 1 VDC

Connection cable

Unscreened cable.
Length as desired, however resistance:
Max. 2 Ω .
Max. error with max. cable resistance: -1°C .

Instrument connection

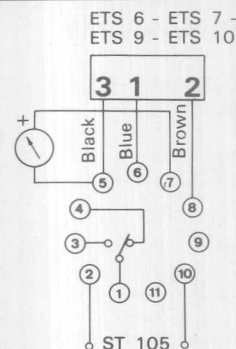
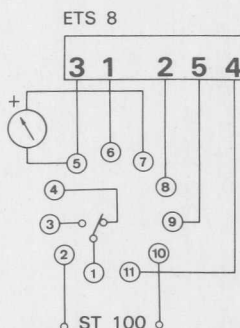
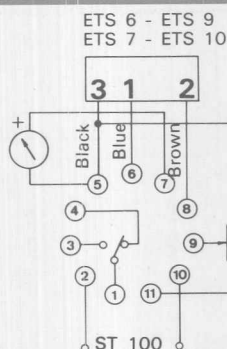
Connection for moving-coil instrument.
Full scale deflection: 1 mA.
To be connected to pins 5 and 7.
Pin 7 positive.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Remote potentiometer kit.
Instruments.
Temperature sensor types:
ETS 6: For liquids.
ETS 7: For gases.
ETS 8: For gases. With built-in potentiometer.
ETS 9: For liquids. With external thread: 3/8" pipe thread.
ETS 10: For measuring the temp. of a metallic surface.
See catalogue on accessories.

WIRING DIAGRAMS



MODE OF OPERATION

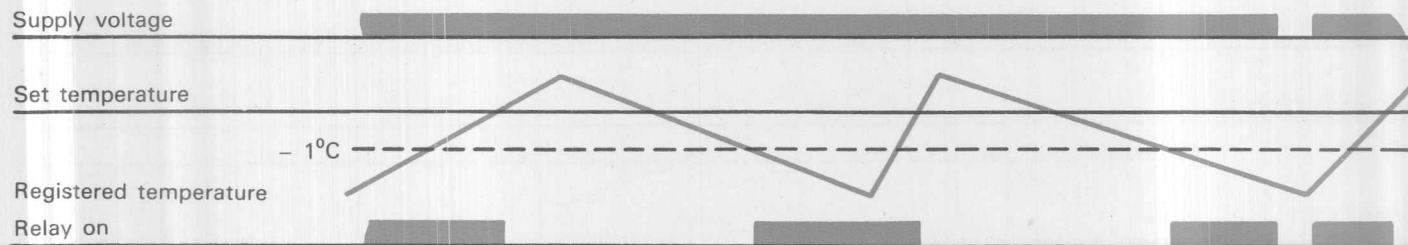
Relay intended to be used as a thermostat for control of oil-burners, circulating pumps, heating and ventilating plants, electric heating elements, etc., in which an adjustment of the temperature is wanted.
The relay releases when the set temperature is achieved, but is energized again when the actual temperature has decreased app. 1°C (hysteresis) below the set temperature level.

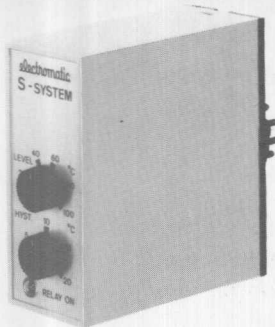
A moving-coil instrument with 1 mA full scale deflection and a scale calibrated in temperature degrees can be connected to the relays in order to visualize the temperatures measured.

The relay generates a voltage of max. 8.2 V on the instrument terminals (pins 5-7) over an internal resistance of 8.2 K Ω . The moving-coil instrument ideally has 110 Ω internal resistance. A deviation of $\pm 100 \Omega$ is however not critical as it shall cause false readings as small as $\pm 1 \%$.

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

OPERATION DIAGRAM





ST 115
Two knobs adjustable

ST 115

- * Temperature control relay for resistive temperature sensors, type ETR.
- * Metering range: -20°C to $+120^{\circ}\text{C}$, divided into 5 sub-ranges.
- * Separate adjustment of working temperature and hysteresis on two built-in potentiometers.
- * Connection for moving-coil instrument.
- * Inversion of relay function possible.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Temperature ranges (Scale ranges)

- 20 to $+10^{\circ}\text{C}$ (a)
- 0 to $+30^{\circ}\text{C}$ (b)
- + 20 to $+80^{\circ}\text{C}$ (c)
- + 60 to $+120^{\circ}\text{C}$ (d)
- 0 to $+100^{\circ}\text{C}$ (e).

Hysteresis (Scale ranges)

1°C to 5°C
for ranges a) and b).
 1°C to 10°C
for ranges c) and d).
 1°C to 20°C
for range e).

Setting of ST 115

Metering ranges:
Top knob.
Hysteresis:
Bottom knob.

Metering voltage

Pins 5 and 7: 2 VDC.
Pin 5 positive.

Connection cable

2-core, normally unscreened.
The screen, if any, to pin 7.
Length as desired. Error per
 $6\ \Omega$ cable resistance:
App. $+1^{\circ}\text{C}$.

Instrument connection

Max. 8.2 V is generated over
pins 7 and 11 (pin 11 positive)
across an internal resistance of
 $8.2\ \text{K}\Omega$.

Applicable for moving-coil instruments with 1 mA full scale deflection and internal resistance $110\ \Omega$, e.g. type ID 120.

Deviations from the ideal internal resistance is not critical as a deviation of $\pm 100\ \Omega$ causes an error of only $\pm 1\%$.

Inversion of relay function

Occurs by interconnecting
pins 8 and 9.

Slave coupler

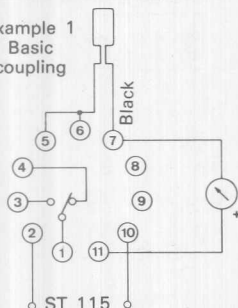
In conjunction with one ETR-sensor and one ST 115 (master) relay, up to 5 ST 115 relays can be slave coupled (example 3). Moreover all coupling combinations are possible between ST 115, ST 010 and ST 185.

Accessories

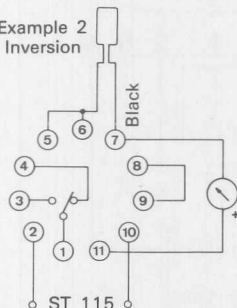
Bases. Hold down spring.
Mounting rack. Base covers.
Front mounting bezel.
Moving-coil instrument, type ID 120.
Temperature sensors, type ETR.
See catalogue on accessories.

WIRING DIAGRAMS

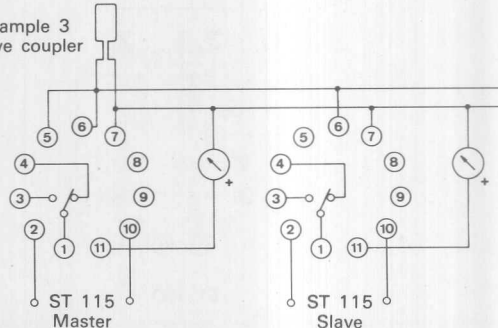
Example 1
Basic coupling



Example 2
Inversion



Example 3
Slave coupler



MODE OF OPERATION

In conjunction with a remote sensor, type ETR, this S-system can be used to control temperature of heaters or refrigerators. In the latter case inverted relay function should be employed as a precaution.

The variable hysteresis makes control by this S-system extra flexible. The supply voltage must continuously be connected to the S-system.

The temperature in $^{\circ}\text{C}$ at which the relay shall operate or release is set on the top potentiometer.

The hysteresis in $^{\circ}\text{C}$, i.e. the difference of temperature required for a change in position of the relay, is set on the bottom potentiometer. If the S-system is used to control a refrigerator, pins 8 and 9 (example 2) are to be interconnected. However, in the case of controlling a heater, these pins should not be connected (example 1).

As shown in the wiring diagrams (example 3), it is possible to slave couple up to 5 S-systems, type ST 115, to the one connected with the ETR-sensor.

A stepwise coupling of heating elements or refrigerators is thus possible. To each of the S-systems in use (with different scale ranges if wanted) a moving-coil instrument, e.g. type ID 120, can be connected.

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

OPERATION DIAGRAM

Supply voltage

Set temperature

Hysteresis

Example 1
Relay on

Example 2
Relay on



ST 119
Digital switch
adjustable

ST 119

- * Temperature control relay for resistive temperature sensors, type ETR.
- * Digital setting of working temperature within the range: -20 to $+120^{\circ}\text{C}$.
- * Temperature resolution: 1°C .
- * Variable hysteresis: 1 to 20°C .
- * Connection for moving-coil instrument indicating within $\pm 30^{\circ}\text{C}$ the difference between set and actual temperature.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10–12.

Hysteresis

Variable within the range 1 to 20°C by connection of an external resistor (0.25 W) between pins 8 and 9.

Hysteresis	Resistor	Hysteresis	Resistor
1°C	∞ 1)	11°C	$12\text{ K}\Omega$
2°C	$240\text{ K}\Omega$	12°C	$10\text{ K}\Omega$
3°C	$120\text{ K}\Omega$	13°C	$8.2\text{ K}\Omega$
4°C	$75\text{ K}\Omega$	14°C	$6.2\text{ K}\Omega$
5°C	$51\text{ K}\Omega$	15°C	$4.7\text{ K}\Omega$
6°C	$39\text{ K}\Omega$	16°C	$3.6\text{ K}\Omega$
7°C	$30\text{ K}\Omega$	17°C	$2.7\text{ K}\Omega$
8°C	$24\text{ K}\Omega$	18°C	$1.6\text{ K}\Omega$
9°C	$18\text{ K}\Omega$	19°C	$820\text{ }\Omega$
10°C	$15\text{ K}\Omega$	20°C	0 2)

1) Pins 8 and 9 are not connected ($R = \infty$).

2) Pins 8 and 9 are interconnected directly ($R = 0$).

Temperature range

-20 to $+120^{\circ}\text{C}$. The desired temperature is set by a 3-digit temperature selector.

Metering voltage

Pins 5 and 7: 2 VDC . Pin 5 positive.

Connection cable

2-core, normally unscreened. Screen, if any, to pin 7. The system is adapted to 3 metres , $2 \times 0.75\text{ mm}^2$ connection cable. Can be extended if necessary. Error per $6\text{ }\Omega$ cable resistance: App. $+1^{\circ}\text{C}$.

Instrument connection

Connection for moving-coil instrument, internal resistance $110\text{ }\Omega$, 1 mA full scale deflection. To be connected to pins 7 and 11. Pin 11 positive. Choose an instrument with zero point in the centre of the scale. The instrument indicates within $\pm 30^{\circ}\text{C}$ the difference between set and ac-

tual temperature.

Differences exceeding 30°C give a full scale deflection but will not damage the instrument.

Slave coupler

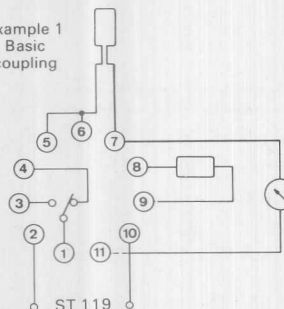
Up to 5 relays type ST 119 can be slave coupled in conjunction with one ETR-sensor enabling a step-wise coupling of heating elements. It is also possible to slave couple amplifier, type ST 010, and thus making indication of absolute temperature within a selected range possible.

Accessories

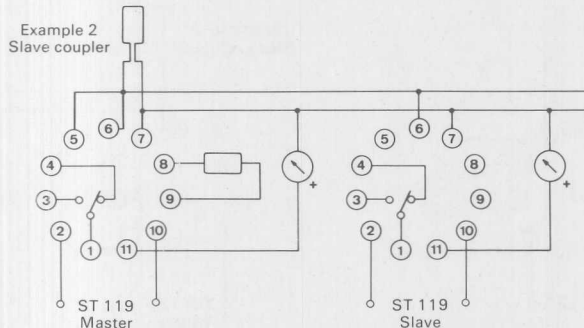
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.
Moving-coil instrument.
Temperature sensors type ETR.

WIRING DIAGRAMS

Example 1
Basic coupling



Example 2
Slave coupler



MODE OF OPERATION

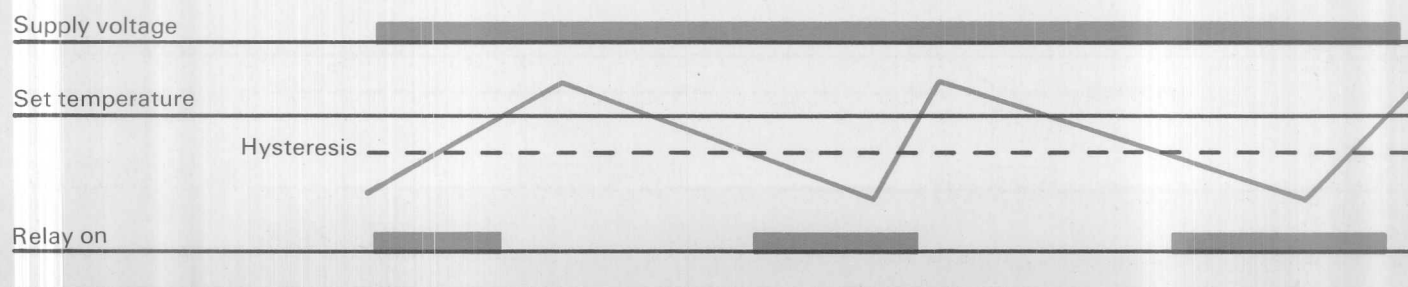
This S-system can in conjunction with a temperature sensor type ETR be employed to control the temperature within the range -20 to $+120^{\circ}\text{C}$. Connection as shown above (example 1). The relay releases when the actual temperature reaches the set value, and operates when the temperature drops below the hysteresis fixed by selection of the related resistor.

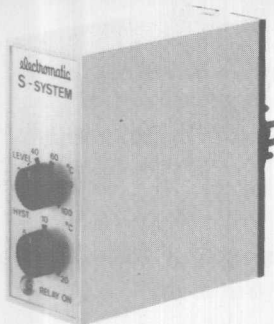
The supply voltage must continuously be applied. The relay releases when the supply voltage is disconnected.

Both amplifier ST 010, relay ST 119 and relay ST 115 can be slave coupled (example 2).

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

OPERATION DIAGRAM





ST 125
Two knobs adjustable

ST 125

- * Relay for standard Pt 100 temperature sensors.
- * Fail safe - the relay releases in case of sensor breakdown.
- * Metering range: - 50 to + 850°C, divided into 10 sub-ranges.
- * Separate adjustment of working temperature and hysteresis on two built-in potentiometers.
- * Connection for moving-coil instrument.
- * Inversion of relay function possible.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Temperature ranges (Δ -scale: 0-100°C)

- 50 to + 50°C
- 0 to + 100°C
- + 100 to + 200°C
- + 200 to + 300°C
- + 300 to + 400°C
- + 400 to + 500°C
- + 500 to + 600°C
- + 600 to + 700°C
- + 700 to + 800°C
- + 750 to + 850°C.

Hysteresis, Scale range

From 1 to 20°C in all temperature ranges mentioned above.

Setting of ST 125

Metering ranges:

Top knob.

Hysteresis:

Bottom knob.

Metering voltage

Pins 5 and 7: 9 VDC.

Pin 5 positive.

Connection cable

2-core, normally unscreened.

Screen, if any, is connected to pin 7. The system is adapted to 3 metres, 2 x 0,75 mm² connection cable. Can be extended if necessary.

Error per 0.3 Ω cable resistance: App. + 1°C.

Instrument connection

Max. 8.2 V is generated over pins 7 and 11 (pin 11 positive) across an internal resistance of 8.2 K Ω .

Applicable for moving-coil instruments with 1 mA full scale deflection and internal resistance 110 Ω , e.g. type ID 120.

Deviations from the ideal internal resistance is not critical as a deviation of $\pm 100 \Omega$ causes an error of only $\pm 1 \%$.

Inversion of relay function

Occurs by interconnecting pins 8 and 9.

Slave coupler

Up to 5 relays, type ST 125, can be slave coupled in conjunction with one standard Pt 100 sensor and one ST 125 (master) relay as shown below (example 3).

Moreover all coupling combinations are possible between ST 125, ST 020 and ST 199.

Accessories

Bases.

Hold down spring.

Mounting rack.

Base cover.

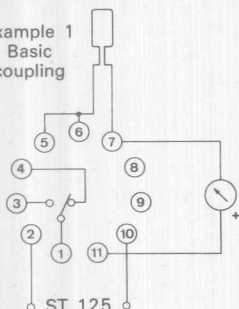
Front mounting bezel.

Moving-coil instrument, type ID 120.

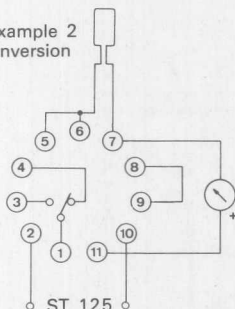
Standard Pt 100 temperature sensors. (DIN 43760).

WIRING DIAGRAMS

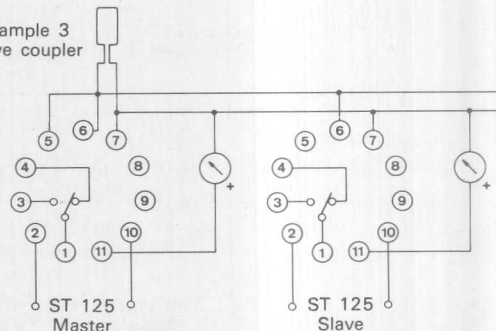
Example 1
Basic coupling



Example 2
Inversion



Example 3
Slave coupler



MODE OF OPERATION

In conjunction with a standard Pt 100 temperature sensor (DIN 43760) this S-system can perform the function of controlling the temperature of heaters or refrigerators. In the latter case inverted relay function should be employed as a precaution.

The variable hysteresis makes control by this S-system extra flexible. The supply voltage must continuously be connected to the S-system.

The temperature, at which the relay shall operate or release, is set on the top potentiometer.

(Δ -scale: 0-100°C).

The hysteresis in °C, i.e. the difference of temperature required for a change in position of the relay, is set on the bottom potentiometer. If the S-system is used to control a refrigerator pins 8 and 9 (example 2) are to be interconnected. However, in the case of controlling a heater these pins should not be connected (example 1).

As shown in the wiring diagrams (example 3) it is possible to slave couple up to 5 S-systems, type ST 125, to the one connected with the Pt 100 sensor. A stepwise coupling of heating elements or refrigerators is thus possible.

To each of the S-systems in use (with different scale ranges if wanted) a moving-coil instrument, e.g. type ID 120, can be connected.

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

OPERATION DIAGRAM

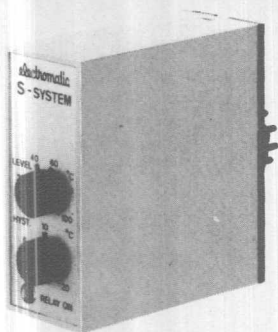
Supply voltage

Set temperature

Hysteresis

Example 1
Relay on

Example 2
Relay on



ST 135
Two knobs adjustable

ST 135

- * Relay for standard Ni 100 temperature sensors.
- * Fail safe - the relay releases in case of sensor breakdown.
- * Metering range: - 60 to + 180°C, divided into 6 sub-ranges.
- * Separate adjustment of working temperature and hysteresis on two built-in potentiometers.
- * Connection for moving-coil instrument.
- * Inversion of relay function possible.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Temperature ranges (Δ-scale: 0-60°C)

- 60 to 0°C
- 20 to + 40°C
- 0 to + 60°C
- + 40 to + 100°C
- + 80 to + 140°C
- + 120 to + 180°C.

Hysteresis, Scale range

From 1 to 10°C in all temperature ranges mentioned above.

Setting of ST 135

Metering ranges:
Top knob.

Hysteresis:
Bottom knob.

Metering voltage

Pins 5 and 7: 2 VDC.
Pin 5 positive.

Connection cable

2-core, normally unscreened.
Screen, if any, is connected to pin 7.

The system is adapted to 3 metres, 2 x 0.75 mm² connection cable. Can be extended if necessary. Error per 0.5 Ω cable resistance: App. + 1°C.

Instrument connection

Max. 8.2 V is generated over pins 7 and 11 (pin 11 positive) across an internal resistance of 8.2 KΩ.

Applicable for moving-coil instruments with 1 mA full scale deflection and internal resistance 110 Ω, e.g. type ID 120.

Deviations from the ideal internal resistance is not critical as a deviation of ± 100 Ω causes an error of only ± 1 %.

Inversion of relay function.

Occurs by interconnecting pins 8 and 9.

Slave coupler

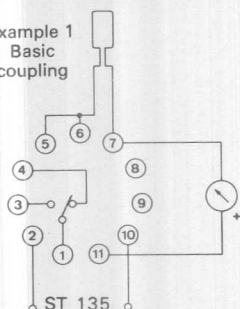
Up to 5 relays, type ST 135, can be slave coupled in conjunction with one Ni 100 standard sensor and one ST 135 (master) relay as shown below (example 3). Moreover all coupling combinations are possible between ST 135 and ST 030.

Accessories

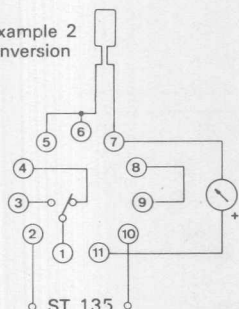
Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.
Moving-coil instrument type ID 120.
Ni 100 standard temperature sensors. (DIN 43760).

WIRING DIAGRAMS

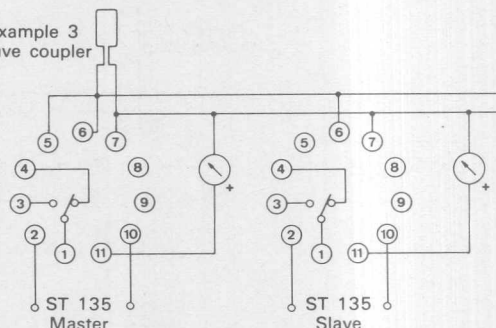
Example 1
Basic coupling



Example 2
Inversion



Example 3
Slave coupler



MODE OF OPERATION

In conjunction with a standard Ni 100 sensor this S-system can perform the function of controlling the temperature of heaters or refrigerators. In the latter case inverted relay function should be employed as a precaution. The variable hysteresis makes control by this S-system extra flexible. The supply voltage must continuously be connected to the S-system.

The temperature, at which the relay shall operate or release, is set on the top potentiometer. (Δ-scale: 0-60°C).

The hysteresis in °C, i.e. the difference of temperature required for a change in position of the relay, is set on the bottom potentiometer. If the S-system is used to control a refrigerator, pins 8 and 9 (example 2) are to be interconnected. However, in the case of controlling a heater, these pins should not be connected (example 1).

As shown in the wiring diagrams (example 3) it is possible to slave couple up to 5 S-systems, type ST 135, to the one connected with the Ni 100 sensor.

A stepwise coupling of heating elements or refrigerators is thus possible. To each of the S-systems in use (with different scale ranges if wanted) a moving-coil instrument, e.g. type ID 120, can be connected.

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

OPERATION DIAGRAM

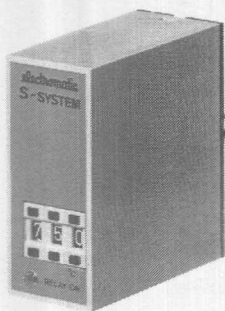
Supply voltage

Set temperature

Hysteresis

Example 1
Relay on

Example 2
Relay on



ST 139
Digital switch
adjustable

ST 139

- * Relay for standard Ni 100 temperature sensors.
- * Digital setting of working temperature within the range: -60 to $+180^{\circ}\text{C}$.
- * Temperature resolution: 1°C .
- * Variable hysteresis: 1 to 20°C .
- * Connection for moving-coil instrument indicating within $\pm 30^{\circ}\text{C}$ the difference between set and actual temperature.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Hysteresis

Variable within the range 1 to 20°C by connection of an external resistor (0.25 W) between pins 8 and 9.

Hysteresis	Resistor	Hysteresis	Resistor
1°C	∞ 1)	11°C	$12\text{ K}\Omega$
2°C	$240\text{ K}\Omega$	12°C	$10\text{ K}\Omega$
3°C	$120\text{ K}\Omega$	13°C	$8.2\text{ K}\Omega$
4°C	$75\text{ K}\Omega$	14°C	$6.2\text{ K}\Omega$
5°C	$51\text{ K}\Omega$	15°C	$4.7\text{ K}\Omega$
6°C	$39\text{ K}\Omega$	16°C	$3.6\text{ K}\Omega$
7°C	$30\text{ K}\Omega$	17°C	$2.7\text{ K}\Omega$
8°C	$24\text{ K}\Omega$	18°C	$1.6\text{ K}\Omega$
9°C	$18\text{ K}\Omega$	19°C	$820\text{ }\Omega$
10°C	$15\text{ K}\Omega$	20°C	0 2)

1) Pins 8 and 9 are not connected ($R = \infty$).

2) Pins 8 and 9 are interconnected directly ($R = 0$).

Temperature range

-60 to $+180^{\circ}\text{C}$. The desired temperature is set by a 3-digit temperature selector.

Metering voltage

Pins 5 and 7: 2 VDC . Pin 5 positive.

Connection cable

2-core, normally unscreened. Screen, if any, to pin 7. The system is adapted to 3 metres , $2 \times 0.75\text{ mm}^2$ connection cable. Can be extended if necessary. Error per $0.5\text{ }\Omega$ cable resistance: App. $+1^{\circ}\text{C}$.

Instrument connection

Connection for moving-coil instrument, internal resistance $110\text{ }\Omega$, 1 mA full scale deflection. To be connected to pins 7 and 11. Pin 11 positive. Choose an instrument with zero point in the centre of the scale. The instrument indicates within $\pm 30^{\circ}\text{C}$ the difference between set and ac-

tual temperature.

Differences exceeding 30°C give a full scale deflection but will not damage the instrument.

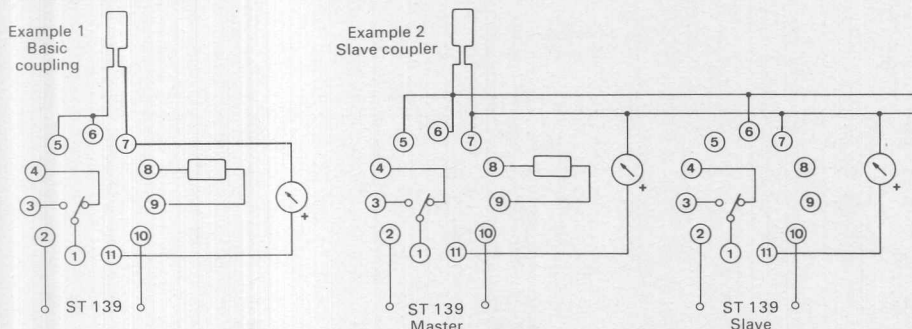
Slave coupler

Up to 5 relays type ST 139 can be slave coupled in conjunction with one Ni 100-sensor enabling a step-wise coupling of heating elements. It is also possible to slave couple amplifier, type ST 030, and thus making indication of absolute temperature within a selected range possible.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.
Moving-coil instrument.
Ni 100 standard temperature sensors.

WIRING DIAGRAMS



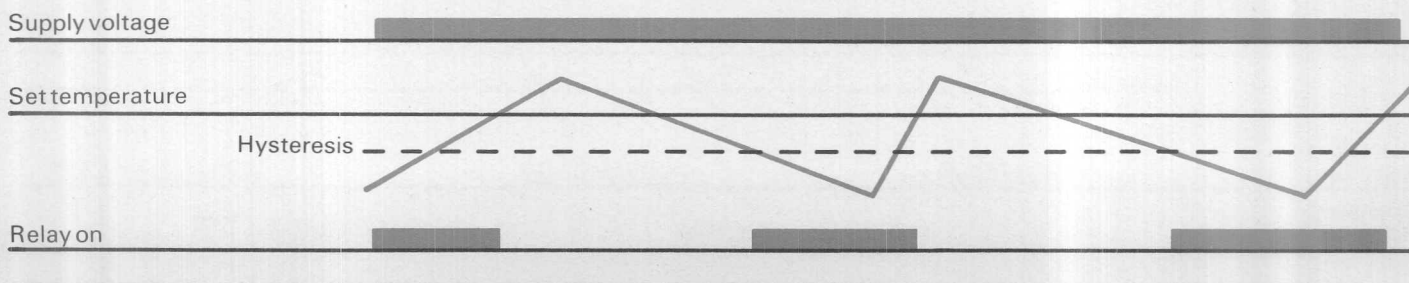
MODE OF OPERATION

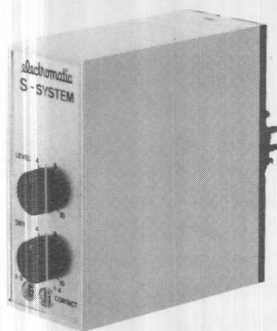
This S-system can in conjunction with a standard Ni 100 temperature sensor (DIN 43760) be employed to control the temperature within the range -60 to $+180^{\circ}\text{C}$. Connection as shown above (example 1). The relay releases when the actual temperature reaches the set value, and operates when the temperature drops below the hysteresis fixed by selection of the related resistor.

The supply voltage must continuously be applied. The relay releases when the supply voltage is disconnected. Both amplifier ST 030, relay ST 135 and relay ST 139 can be slave coupled (example 2).

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

OPERATION DIAGRAM





ST 145
Two knobs adjustable

ST 145

- * Difference relay for semi-conductor temperature sensors.
- * Sensing range: -20°C to $+120^{\circ}\text{C}$.
- * Difference: 1.5°C to 5°C .
- * Selection of 4 temperature sensors.
- * Dual knob-adjustment of difference- and reference temperatures.
- * Connection for moving-coil instrument.
- * 10 A SPDT output relay with neutral position.
- * LED-indications of both relay positions.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Adjustment

Adjustment of difference- and reference temperatures by means of 2 independent built-in potentiometers.

The upper knob:

Adjustment of reference temperature.

The lower knob:

Adjustment of difference temperature.

Measuring voltage

Pins 5-6: 7 VDC.

Pins 5-8: 1 VDC.

Measuring range

-20°C to $+120^{\circ}\text{C}$ in 4 temperature ranges:

-20°C to $+10^{\circ}\text{C}$

0°C to $+30^{\circ}\text{C}$

$+20^{\circ}\text{C}$ to $+80^{\circ}\text{C}$

$+60^{\circ}\text{C}$ to $+120^{\circ}\text{C}$.

Hysteresis

Approx. 1°C .

Difference

Adjustable difference temperature:

$+1.5^{\circ}\text{C}$ to $+5^{\circ}\text{C}$.

Connection cable

Unscreened, 3-core cable.

Length as desired, however resistance: Max. 2 Ω

Max. error with max. cable resistance: -1°C .

Instrument connection

Connection for moving-coil instrument.

1 mA full scale deflection.

To be connected to pins 5-7.

Pin 7 positive.

Accessories

Bases.

Hold down spring.

Mounting rack.

Base covers.

Front mounting bezel.

Instruments.

Temperature sensors:

ETS 6: For liquids.

ETS 7: For gases.

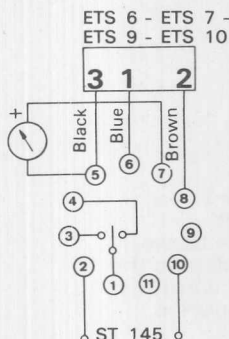
ETS 9: For liquids.

With external thread: $3/8''$ pipe thread.

ETS 10: For measuring the temperature of a metallic surface.

See catalogue on accessories.

WIRING DIAGRAM



$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

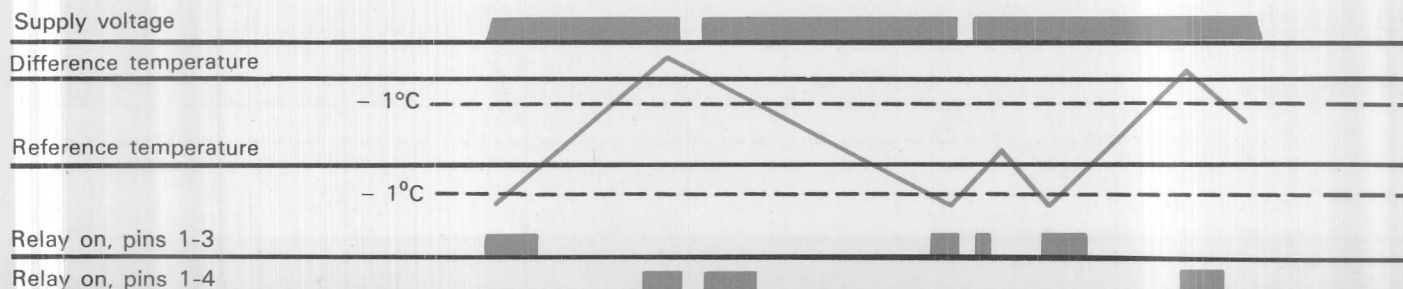
MODE OF OPERATION

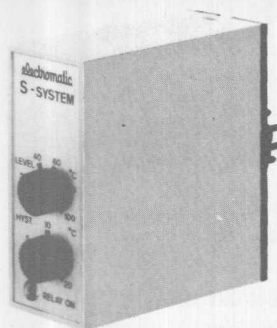
The ST 145 is used in conjunction with appropriate sensors, for example in air-conditioning plants, where both a heater and a refrigerator or fan must be controlled in mutual dependence. Contacts 1-3, controlling the heater, shall open when the rising temperature reaches the set temperature level, and shall not close again until the temperature falls 1°C , being the hysteresis, below that level.

Contacts 1-4, controlling the refrigerator or fan shall close when the rising temperature reaches a value being the sum of the set temperature level, plus the set differential value, and it shall not open again until the temperature falls 1°C , which is the hysteresis. The nominal operating temperature is set within the range of the relay on the upper knob, whereas the differential temperature is set between $+1.5$ and $+5^{\circ}\text{C}$ on the lower knob.

A moving-coil instrument with 1 mA full deflection and a scale calibrated in temperature degrees can be connected to the ST 145 relay in order to visualize the temperatures measured. The relay generates max. 8.2 V on the instrument terminals (pins 5-7) over an internal resistance of 8.2 K Ω . The moving-coil instrument ideally has 110 Ω internal resistance. A deviation of $\pm 100 \Omega$ is however not critical as it shall cause false readings as small as $\pm 1\%$.

OPERATION DIAGRAM





ST 155
Two knobs adjustable

ST 155

- * Relay for standard Fe-Ko thermocouples.
- * Metering range: 50 - 600°C, divided into 3 sub-ranges.
- * Separate adjustment of trip temperature and hysteresis on two potentiometers.
- * Separate absolute scales in °C for trip temperature and hysteresis.
- * Connection for moving-coil instrument.
- * Inversion of relay function possible.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key Pages 10-12.

Temperature ranges
50 - 300°C
150 - 400°C
350 - 600°C.

Hysteresis
Adjustable, 1-20°C.

Adjustment of trip temperature
Is set at top scale (°C).

Adjustment of hysteresis
Is set at bottom scale (°C).

Linearity deviation
Less than 1 % of measured temperature.

Range accuracy, trip temperature
± 2.5°C on min.
± 2.5°C on max.

Range accuracy, hysteresis
± 2°C.

Max. variation
Within the limits of rated supply voltage and ambient temperature:
Metering range: < 2 %.
Hysteresis: < 2°C.

Thermocouples
Standard Fe-Ko types according to DIN 43710; ANSI, symbol »J«.

Connection between thermocouple and S-system
Via compensating box type ETC 1 with 4-core, screened, copper cable. Thermocouple leads are connected to the terminal screws of the ETC 1 box as shown below.

Limits of ambient temperature for compensating box, type ETC 1
- 20 to + 60°C.

Inversion of relay function
Occurs by interconnecting pins 8 and 9 as shown by a stippled line on the wiring diagram.

Instrument connection
Max. 8.2 V is generated over pins 7 and 11 (pin 11 positive) across

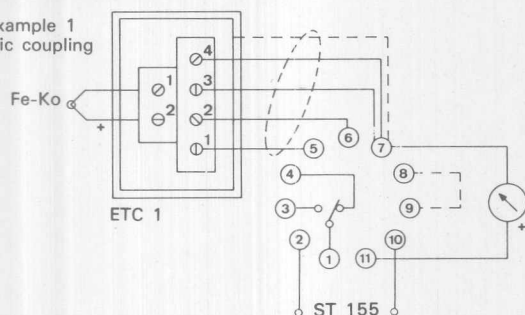
an internal resistance of 8.2 KΩ. Applicable for moving-coil instruments with 1 mA full scale deflection and internal resistance 110 Ω, e.g. type ID 120. Deviations from the ideal internal resistance is not critical as a deviation of ± 100 Ω causes an error of only ± 1 %.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.
Moving-coil instrument type ID 120.
Compensating box type ETC 1.
Standard Fe-Ko thermocouples, according to DIN 43710 (ANSI, symbol »J«).

WIRING DIAGRAM

Example 1
Basic coupling



Example 2
Inversion.

The stippled line between pins 8 and 9 indicates the interconnection when the function is inverted.

MODE OF OPERATION

In conjunction with a standard Fe-Ko thermocouple this S-system can perform the function of controlling the temperature of heaters or refrigerators. In the latter case inverted relay function should be employed as a precaution. The variable hysteresis makes control by this S-system extra flexible. The supply voltage must continuously be connected to the S-system.

The temperature in °C at which the relay shall operate or release is set on the top potentiometer. The hysteresis in °C, i.e. the difference of temperature required for a change in position of the relay, is set on the bottom potentiometer. If the S-system is used to control a refrigerator, pins 8 and 9 (example 2) are to be interconnected. However, in the case of controlling a heater, these pins should not be connected (example 1).

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

OPERATION DIAGRAM

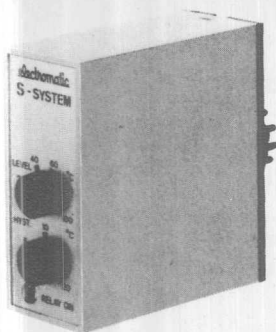
Supply voltage

Set temperature

Hysteresis

Example 1
Relay on

Example 2
Relay on



ST 165
Two knobs adjustable

ST 165

- * Relay for standard NiCr-Ni thermocouples.
- * Metering range: 50 - 1300°C, divided into 6 sub-ranges.
- * Separate adjustment of trip temperature and hysteresis on two potentiometers.
- * Separate absolute scales in °C for trip temperature and hysteresis.
- * Connection for moving-coil instrument.
- * Inversion of relay function possible.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Temperature ranges (Scale ranges)

50 - 300°C
250 - 500°C
450 - 700°C
650 - 900°C
850 - 1100°C
1050 - 1300°C.

Hysteresis

Adjustable, 1-20°C.

Adjustment of trip temperature

Is set at top scale (°C).

Adjustment of hysteresis

Is set at bottom scale (°C).

Linearity deviation

Less than 1 % of measured temperature.

Range accuracy, trip temperature

± 2.5°C on min.
± 2.5°C on max.

Range accuracy, hysteresis

± 2°C.

Max. variation

Within the limits of rated supply voltage and ambient temperature:

Metering range: < 2 %
Hysteresis: < 2°C.

Thermocouples

Standard NiCr-Ni thermocouples according to DIN 43710; ANSI, symbol »K«.

Connection between thermocouple and S-system

Via compensating box type ETC 1 with 4-core, screened, copper cable. Thermocouple leads are connected to the terminal screws of the ETC 1 box as shown below.

Limits of ambient temperature for compensating box, type ETC 1

- 20 to + 60°C.

Inversion of relay function

Occurs by interconnecting pins 8 and 9 as shown by a stippled line on the wiring diagram.

Instrument connection

Max. 8.2 V is generated over pins 7 and 11 (pin 11 positive) across an internal resistance of 8.2 KΩ. Applicable for moving-coil instru-

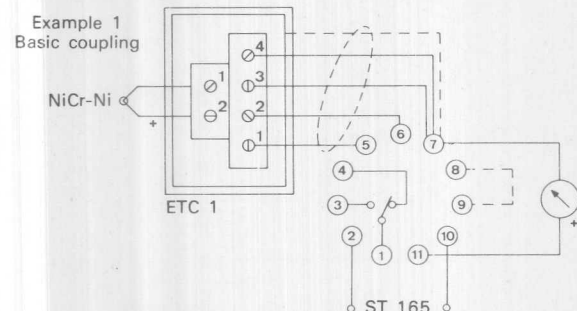
ments with 1 mA full scale deflection and internal resistance 110 Ω, e.g. type ID 120. Deviations from the ideal internal resistance is not critical as a deviation of ± 100 Ω causes an error of only ± 1 %.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.
Moving-coil instrument type ID 120.
Compensating box type ETC 1.
Standard NiCr-Ni thermocouples, according to DIN 43710 (ANSI, symbol »K«).

See catalogue on accessories.

WIRING DIAGRAM



Example 2
Inversion.
The stippled line between pins 8 and 9 indicates the interconnection when the function is inverted.

MODE OF OPERATION

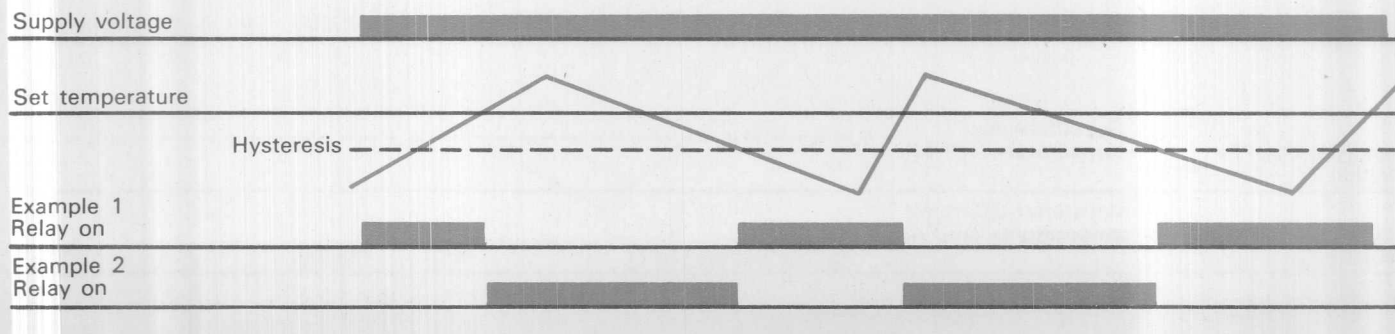
In conjunction with a standard NiCr-Ni thermocouple this S-system can perform the function of controlling the temperature of heaters or refrigerators. In the latter case inverted relay function should be employed as a precaution. The variable hysteresis makes control by this S-system extra flexible. The supply voltage must continuously be connected to the S-system.

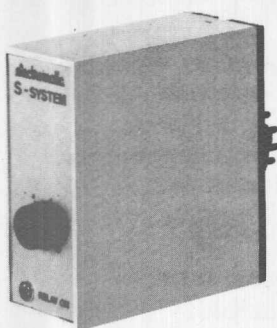
The temperature in °C at which the relay shall operate or release is set on the top potentiometer.

The hysteresis in °C, i.e. the difference of temperature required for a change in position of the relay, is set on the bottom potentiometer. If the S-system is used to control a refrigerator, pins 8 and 9 (example 2) are to be interconnected. However, in the case of controlling a heater, these pins should not be connected (example 1).

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

OPERATION DIAGRAM





ST 175
Knob-adjustable

ST 175

- * Difference relay for semi-conductor temperature sensors.
- * Temperature range: -20°C to $+120^{\circ}\text{C}$.
- * Adjustable difference temperature: $+3^{\circ}\text{C}$ to $+10^{\circ}\text{C}$.
- * Knob-adjustable.
- * Selection of 4 temperature sensors.
- * Connection for moving-coil instrument.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Adjustment

Adjustment of the difference temperature by means of built-in potentiometer.

Difference temperature Operate

The temperature difference ($T_1 - T_2$) at which the relay operates, is adjustable between $+3^{\circ}\text{C}$ to $+10^{\circ}\text{C}$.

Difference temperature Release

The difference temperature at which the relay releases, is factory-set at $+2^{\circ}\text{C}$. ($T_1 - T_2 = 2^{\circ}\text{C}$).

Temperature range

-20°C to $+120^{\circ}\text{C}$.

Measuring voltage

Pins 6-7 } : 7 VDC
Pins 7-8 } : 7 VDC
Pin 7 negative.

Pins 5-7 } : 1 VDC
Pins 7-9 } : 1 VDC
Pin 7 negative.

Connection cable

Unscreened, 3-core cable. Length as desired, however resistance: Max. $2\ \Omega$
Max. error as a consequence of max. cable resistance: -1°C .

Instrument connection

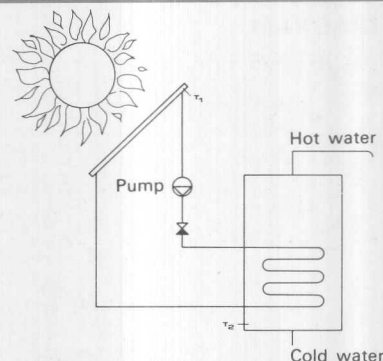
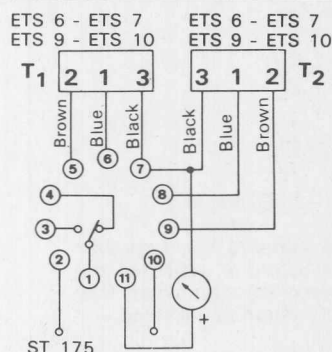
Connection for moving-coil instrument.
Full scale deflection: 1 mA.
Internal resistance of the instrument: $300\ \Omega$
By measuring $T_1 < T_2$ an instrument with scale with neutral centre position must be used. To be connected to pins 7 and 11. Pin 7 neg.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Temperature sensors:
ETS 6: For liquids.
ETS 7: For gases.
ETS 9: For liquids.
With outside thread: $3/8''$ pipe thread.
ETS 10: For measuring the temperature of a metallic surface.
See catalogue on accessories.

WIRING DIAGRAM



MODE OF OPERATION

The ST 175 is most frequently used to control the flow of water in solar heating systems and is operated in conjunction with 2 semi-conductor sensors. The relay reacts to certain temperature differences in the following way:

When the temperature in the solar panel (measuring point T1) exceeds the temperature in the watertank used to accumulate the heat (measuring point T2) by a predetermined value, the relay shall operate. On the relative scale of the ST 175 the small-

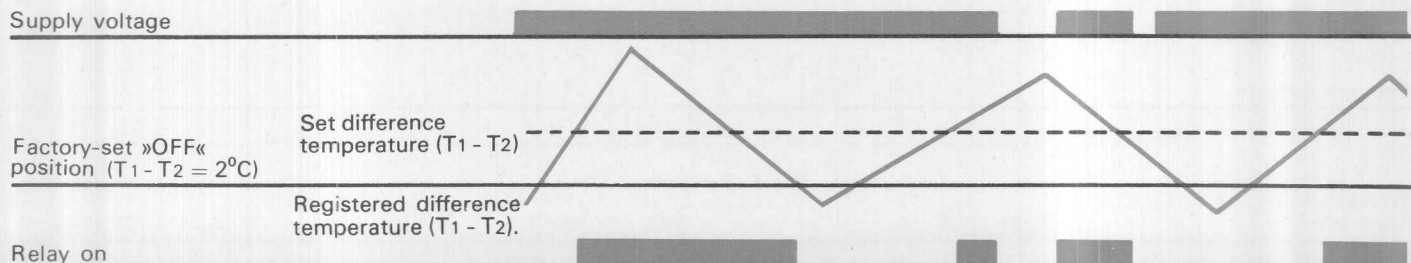
est differential temperature ($T_1 > T_2$), at which the relay shall operate, can be set to any desired value between 3 and 10°C . The relay shall not release until the temperature difference is reduced to 2°C ($T_1 - T_2 = 2^{\circ}\text{C}$). A moving-coil instrument with an internal resistance of $300\ \Omega$ and 1mA full scale deflection can be connected to the ST 175. A deviation in the internal resistance of $\pm 100\ \Omega$ causes an error indication of $\pm 1^{\circ}\text{C}$.

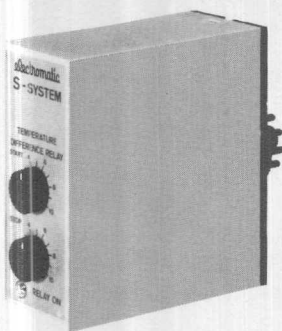
Full scale deflection corresponds to 10°C .

Temperature differences in excess of 10°C shall not damage the instrument, but shall only be displayed as full scale deflection. In cases where it is required to display also a negative temperature difference ($T_1 < T_2$) an instrument with its neutral position in the middle of the scale must be used.

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

OPERATION DIAGRAM





ST 185
Two knobs adjustable

ST 185

- * Temperature difference relay for two ETR-sensors.
- * Suitable for control of the water circulation in solar heating systems.
- * Separate knob-adjustment of START- and STOP difference temperature on two potentiometers.
- * Temperature range: - 20 to + 120°C.
- * Connection for moving-coil instrument.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

START difference temperature

Is set on the top knob within the range 1 to 20°C. (Relative scale).

STOP difference temperature
Is set on the bottom knob within the range 0-6°C. (Relative scale).

START/STOP relations

The START difference temperature will always be min. 1°C above the STOP difference temperature irrespective of the set values.

Temperature range
- 20 to + 120°C.

Metering voltage, sensors
2 VDC, pin 7 negative.

Sensor connection

Sensor T₁ (to be placed in solar panel): Pins 6-7. Black core should be connected to pin 7 (negative). Remember permanent interconnection between pins 5 and 6.

Sensor T₂ (to be placed in water tank): Pins 7 and 8. Black core should be connected to pin 7 (negative). Remember permanent interconnection between pins 8 and 9.

Connection cable, sensor
2-core, normally unscreened. Screen, if any, to pin 7. The cable can be extended if necessary. Error per 6 Ω cable resistance: App. + 1°C.

Instrument connection

Max. 8.2 V is generated over pins 7 and 11 (pin 11 positive) across an internal resistance of 8.2 KΩ. Applicable for moving-coil instruments with 1 mA full scale deflection and internal resistance 110 Ω, e.g. type ID 120. Deviations from the ideal internal resistance is not critical as a deviation of ± 100 Ω causes an error of only ± 1 %.

The instrument indicates the actual temperature difference between the sensors T₁ and T₂ (T₁ minus T₂) within the range 0 to + 20°C, irrespective of the setting of the START/STOP difference values.

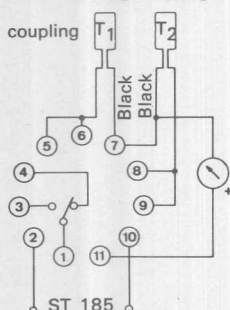
Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.
Moving-coil instrument, type ID 120.
Temperature sensors, type ETR.

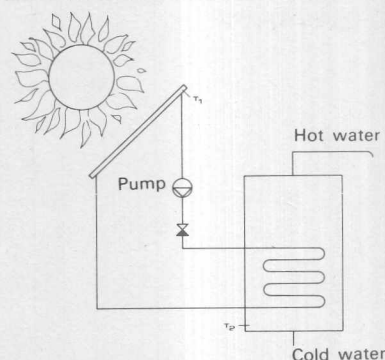
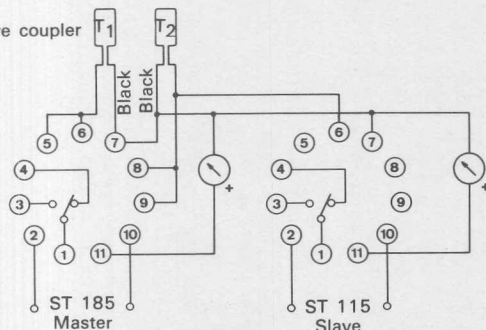
See catalogue on accessories.

WIRING DIAGRAMS

Basic coupling



Slave coupler



MODE OF OPERATION

ST 185 is a metering relay for differences of temperature, and in conjunction with 2 temperature sensors, type ETR, applicable for control of the flow of water in solar heating systems.

The water temperature is permanently metered, both in the solar panel (T₁) and in the water tank (T₂).

When the set START difference temperature is attained (T₁ > T₂) as a result of solar radiation, the relay will operate and hereby start a circulating pump driving hot water from the solar panel to the storage tank.

The relay will release and the circulation pump stop when the set STOP difference temperature is reached.

ST 185 may be used in conjunction with a temperature control relay, type ST 115, or more in case it is necessary either to supplement with electric heating or to remove surplus heat from the storage tank in order to avoid boiling.

Note that the ETR sensor(s) already used for the ST 185 can simultaneously feed the input terminals of relays, type ST 115.

If display of the temperature in the solar panel and/or the storage tank is wanted, one or two ST 010 systems are added in conjunction with matching moving-coil instruments.

Note that also the ST 010 systems can be simultaneously fed from the ETR sensor(s) already in use with the ST 185.

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

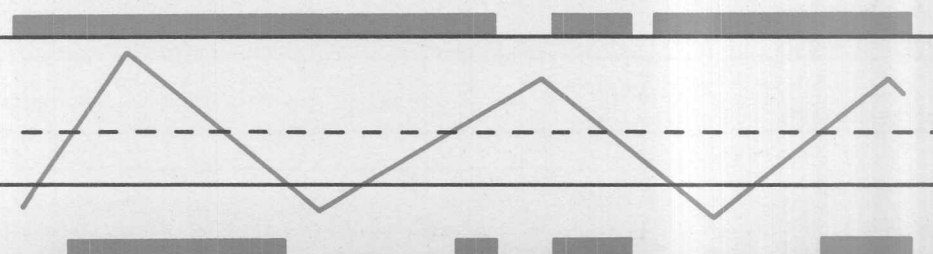
OPERATION DIAGRAM

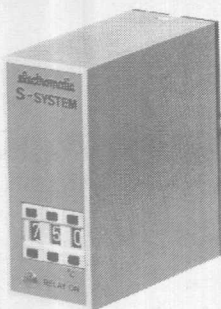
Supply voltage

Set START difference 1-20°C.

Set STOP difference 0-6°C.

Relay on, pins 1-3.





ST 199
Digital switch
adjustable

ST 199

- * Relay for standard Pt 100 temperature sensors (DIN 43760).
- * Digital setting of working temperature within the range: 0 to 900°C.
- * Temperature resolution: 1°C.
- * Variable hysteresis: 1 to 20°C.
- * Connection for moving-coil instrument indicating within $\pm 30^\circ\text{C}$ the difference between set and actual temperature.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Hysteresis

Variable within the range 1 to 20°C by connection of an external resistor (0.25 W) between pins 8 and 9.

Hysteresis	Resistor	Hysteresis	Resistor
1°C	∞ 1)	11°C	12 K Ω
2°C	240 K Ω	12°C	10 K Ω
3°C	120 K Ω	13°C	8.2 K Ω
4°C	75 K Ω	14°C	6.2 K Ω
5°C	51 K Ω	15°C	4.7 K Ω
6°C	39 K Ω	16°C	3.6 K Ω
7°C	30 K Ω	17°C	2.7 K Ω
8°C	24 K Ω	18°C	1.6 K Ω
9°C	18 K Ω	19°C	820 Ω
10°C	15 K Ω	20°C	0 2)

1) Pins 8 and 9 are not connected ($R = \infty$).

2) Pins 8 and 9 are interconnected directly ($R = 0$).

Temperature range

0 til 900°C. The desired temperature is set by a 3-digit temperatur selector.

Metering voltage

Pins 5 and 7: 9 VDC. Pin 5 positive.

Connection cable

2-core, normally unscreened. Screen, if any, to pin 7. The system is adapted to 3 metres, 2 x 0.75 mm² connection cable. Can be extended if necessary. Error per 0.3 Ω cable resistance: App. + 1°C.

Instrument connection

Connection for moving-coil instrument, internal resistance 110 Ω , 1 mA full scale deflection. To be connected to pins 7 and 11. Pin 11 positive. Choose an instrument with zero point in the centre of the scale. The instrument indicates within $\pm 30^\circ\text{C}$ the difference

between set and actual temperature. Differences exceeding 30°C give a full scale deflection but will not damage the instrument.

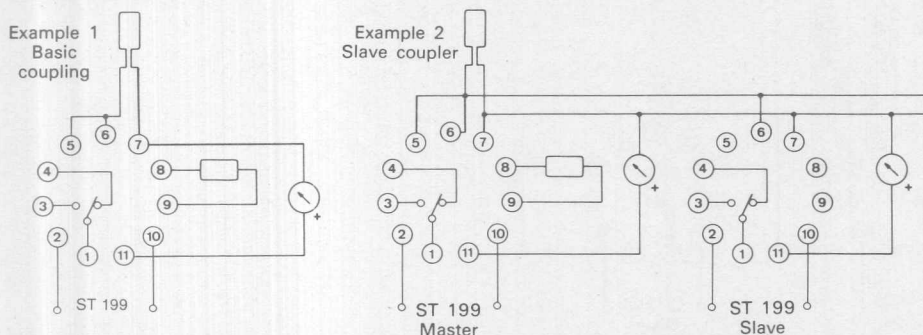
Slave coupler

Up to 5 relays type ST 199 can be slave coupled in conjunction with one Pt 100-sensor enabling a stepwise coupling of heating elements. It is also possible to slave couple amplifier, type ST 020, and thus making indication of absolute temperature within a selected range possible.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.
Moving-coil instrument.
Pt 100 standard temperature sensors.

WIRING DIAGRAMS



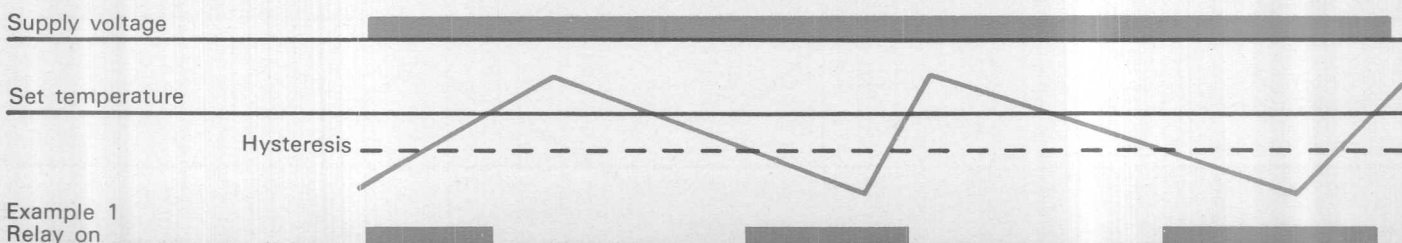
MODE OF OPERATION

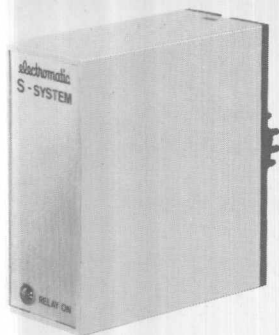
This S-system can in conjunction with a standard Pt 100 temperature sensor (DIN 43760) be employed to control the temperature within the range 0-900°C. Connection as shown above (example 1). The relay releases when the actual temperature reaches the set value, and operates when the temperature drops below the hysteresis fixed by selection of the related resistor.

The supply voltage must continuously be applied. The relay releases when the supply voltage is disconnected. Both amplifier ST 020, relay ST 125 and relay ST 199 can be slave coupled (example 2).

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 32.$$

OPERATION DIAGRAM





SV 110/210
Factory-set sensitivity

SV 110/210

- * Level control for conductive liquids.
- * MAX.-MIN. control of DISCHARGING.
- * Factory-set sensitivity.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Sensitivity

When the resistance between pins 5-6 and 7 is less than 25 K Ω the relay operates, and it does not release until the resistance between pins 6 and 7 is greater than 35 K Ω .

Sensor voltage

Max. 24 VAC.

Sensor current

Max. 2.5 mA.

Connection cable between sensor and amplifier

2- or 3-core plastic cable, normally unscreened.
Cable length:
Max. 100 metres.

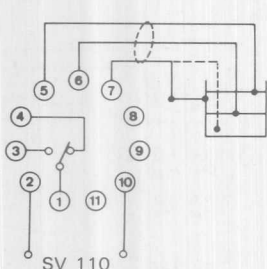
The resistance between the cores and ground must be at least 220 K Ω .
In certain cases it is recommended to use screened cable between sensor and amplifier, e. g. where the cable is placed parallel to load cables.
The screen is connected to pin 7.

Accessories

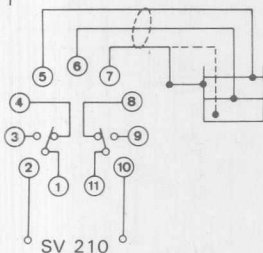
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Level probes type VH, type VPC, VPP, type VN, VNY, type VT, type VS.
See catalogue on accessories.

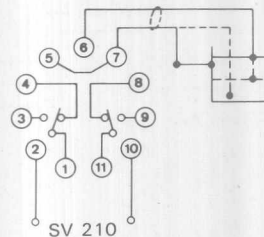
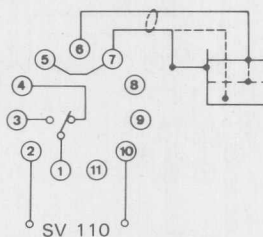
WIRING DIAGRAMS



Example 1



Example 2



MODE OF OPERATION

Max. and/or min. control for DISCHARGING of conductive liquids.
Relay for control of CHARGING, see SV 120/220.

Example 1

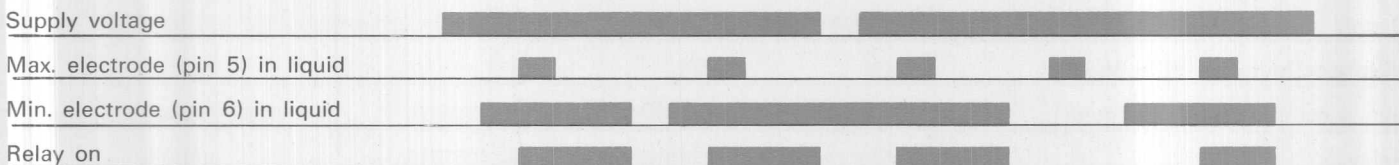
The diagram shows the level control connected as max. and min. control, i.e. registration of 2 levels.
The relay operates when the liquid reaches the max. electrode (pin 5), provided that the min. electrode (pin 6) is in contact with the liquid.

The relay releases when the min. electrode is no longer in contact with the liquid. Pin 7 has to be connected to the container. If the container consists of a non-conductive material, an additional electrode has to be used which is connected to pin 7.
In the diagram this electrode is shown by the dotted line.

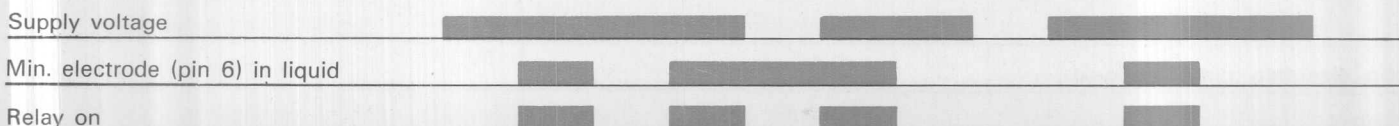
Example 2

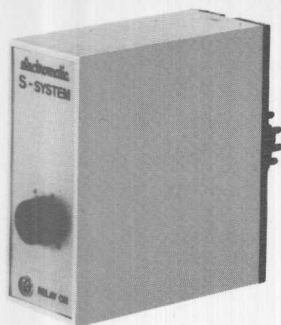
The diagram shows the level control connected as max. or min. control, i.e. registration of 1 level.
The relay operates when the electrode (pin 6) is in contact with the liquid.
Again an additional electrode has to be used, if the container consists of a non-conductive material.
(To be connected to pin 7).

OPERATION DIAGRAM Ex. 1.



OPERATION DIAGRAM Ex. 2.





SV 115/215
Adjustable sensitivity

SV 115/215

- * Level control for conductive liquids.
- * MAX.-MIN. control of DISCHARGING.
- * Adjustable sensitivity.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Sensitivity

Knob-adjustable sensitivity with relative scale.
ON from 3.5 K Ω to 25 K Ω .
OFF from 8 K Ω to 45 K Ω .

Sensor voltage

Max. 24 VAC.

Sensor current

Max. 2.5 mA.

Connection cable between sensor and amplifier

2- or 3-core plastic cable, normally unscreened.
Cable length:
Max. 100 metres.

The resistance between the cores and ground must be at least 220 K Ω .

In certain cases it is recommended to use screened cable between sensor and amplifier, e. g. where the cable is placed parallel to load cables.

The screen is connected to pin 7.

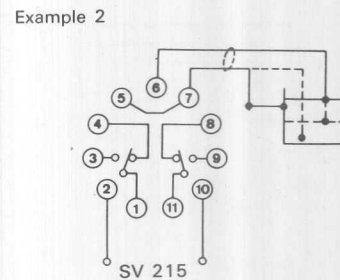
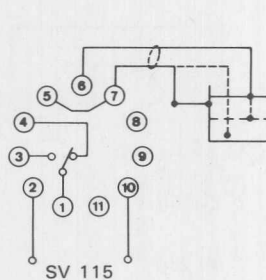
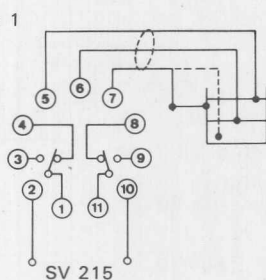
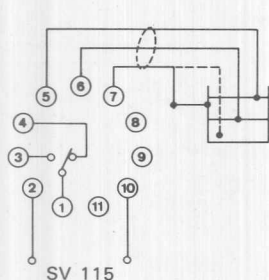
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Level probes type VH, type VPC, VPP, type VN, VNY, type VT, type VS.

See catalogue on accessories.

WIRING DIAGRAMS



MODE OF OPERATION

Max. and/or min. control for DISCHARGING of conductive liquids.
Relay for control of CHARGING, see SV 125/225.

Example 1

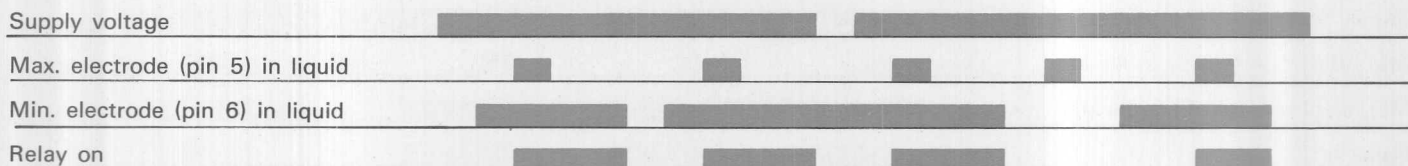
The diagram shows the level control connected as max. and min. control, i.e. registration of 2 levels.
The relay operates when the liquid reaches the max. electrode (pin 5), provided that the min. electrode (pin 6) is in contact with the liquid.

The relay releases when the min. electrode is no longer in contact with the liquid. Pin 7 has to be connected to the container. If the container consists of a non-conductive material, an additional electrode has to be used which is connected to pin 7.
In the diagram this electrode is shown by the dotted line.

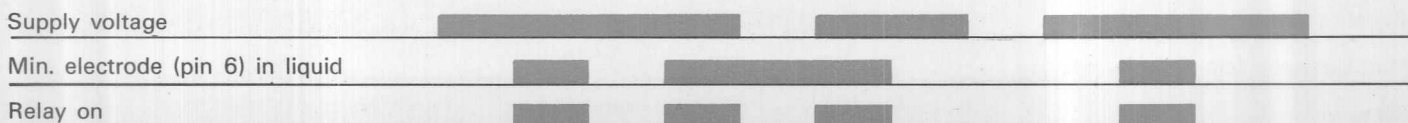
Example 2

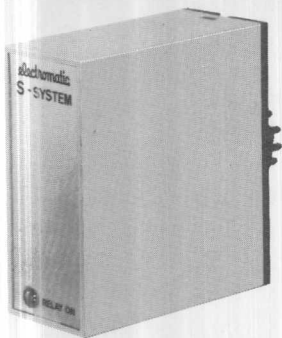
The diagram shows the level control connected as max. or min. control, i.e. registration of 1 level.
The relay operates when the electrode (pin 6) is in contact with the liquid. Again an additional electrode has to be used, if the container consists of a non-conductive material.
(To be connected to pin 7).

OPERATION DIAGRAM Ex. 1.



OPERATION DIAGRAM Ex. 2.





SV 120/220
Factory-set sensitivity

SV 120/220

- * Level control for conductive liquids.
- * MAX.-MIN. control of CHARGING.
- * Factory-set sensitivity.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Sensitivity

When the resistance between pins 5-6 and 7 is less than 25 K Ω the relay releases, and it does not operate until the resistance between pins 6 and 7 is greater than 35 K Ω .

Sensor voltage
Max. 24 VAC.

Sensor current
Max. 2.5 mA.

Connection cable between sensor and amplifier

2- or 3-core plastic cable, normally unscreened.
Cable length:
Max. 100 metres.

The resistance between the cores and ground must be at least 220 K Ω .

In certain cases it is recommended to use screened cable between sensor and amplifier, e. g. where the cable is placed parallel to load cables.

The screen is connected to pin 7.

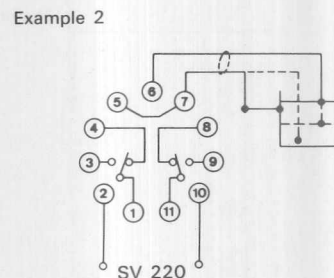
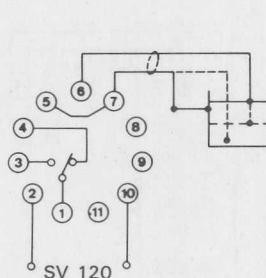
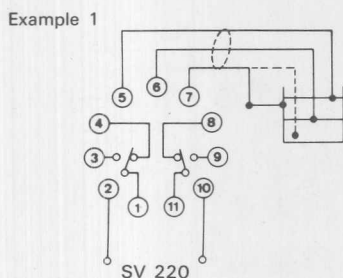
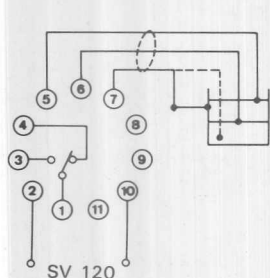
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Level probes type VH, type VPC, VPP, type VN, VNY, type VT, type VS.

See catalogue on accessories.

WIRING DIAGRAMS



MODE OF OPERATION

Max. and/or min. control for CHARGING of conductive liquids.
Relay for control of DISCHARGING, see SV 110/210.

Example 1

The diagram shows the level control connected as max. and min. control, i.e. registration of 2 levels.
The relay releases when the liquid reaches the max. electrode (pin 5), provided that the min. electrode (pin 6) is in contact with the liquid.

The relay operates when the min. electrode is no longer in contact with the liquid. Pin 7 has to be connected to the container.

If the container consists of a non-conductive material, an additional electrode has to be used which is connected to pin 7.

In the diagram this electrode is shown by the dotted line.

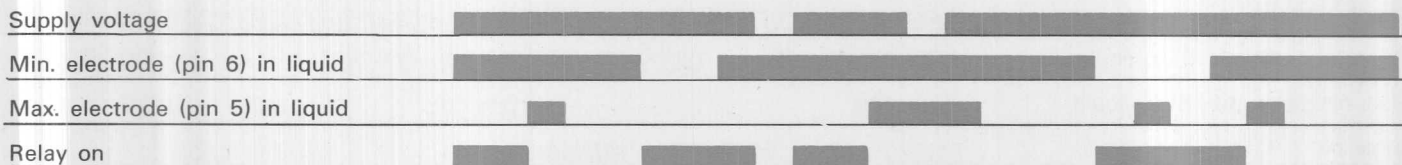
Example 2

The diagram shows the level control connected as max. or min. control, i.e. registration of 1 level.

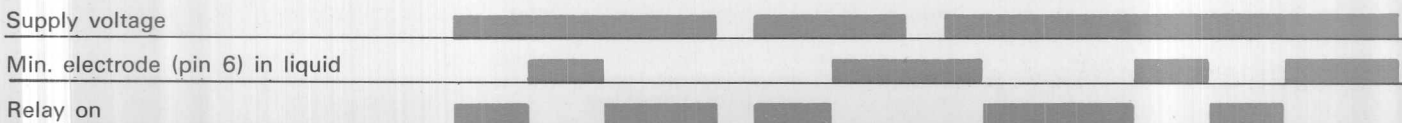
The relay releases when the electrode (pin 6) is in contact with the liquid. Again an additional electrode has to be used, if the container consists of a non-conductive material.

(To be connected to pin 7).

OPERATION DIAGRAM Ex. 1.



OPERATION DIAGRAM Ex. 2.





SV 125/225
Adjustable sensitivity

SV 125/225

- * Level control for conductive liquids.
- * MAX.-MIN. control of CHARGING.
- * Adjustable sensitivity.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Sensitivity

Knob-adjustable sensitivity with relative scale.

OFF from 3.5 K Ω to 25 K Ω .
ON from 8 K Ω to 45 K Ω .

Sensor voltage
Max. 24 VAC.

Sensor current
Max. 2.5 mA.

Connection cable between sensor and amplifier

2- or 3-core plastic cable, normally unscreened.
Cable length:
Max. 100 metres.

The resistance between the cores and ground must be at least 220 K Ω .

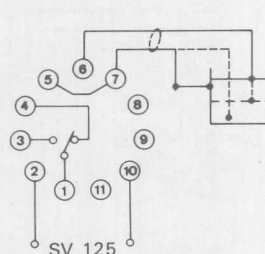
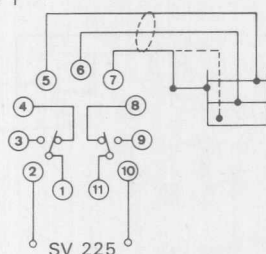
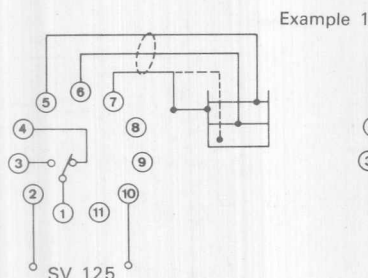
In certain cases it is recommended to use screened cable between sensor and amplifier, e. g. where the cable is placed parallel to load cables.
The screen is connected to pin 7.

Accessories

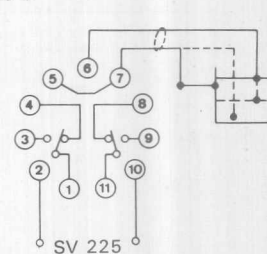
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Level probes type VH, type VPC, VPP, type VN, VNY, type VT, type VS.
See catalogue on accessories.

WIRING DIAGRAMS



Example 2



MODE OF OPERATION

Max. and/or min. control for CHARGING of conductive liquids.
Relay for control of DISCHARGING, see SV 115/215.

Example 1

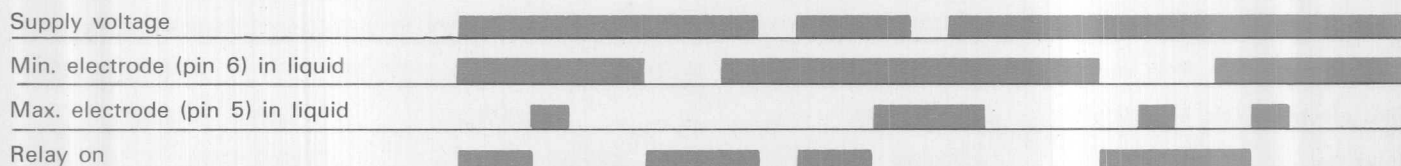
The diagram shows the level control connected as max. and min. control, i.e. registration of 2 levels.
The relay releases when the liquid reaches the max. electrode (pin 5), provided that the min. electrode (pin 6) is in contact with the liquid.

The relay operates when the min. electrode is no longer in contact with the liquid. Pin 7 has to be connected to the container. If the container consists of a non-conductive material, an additional electrode has to be used which is connected to pin 7.
In the diagram this electrode is shown by the dotted line.

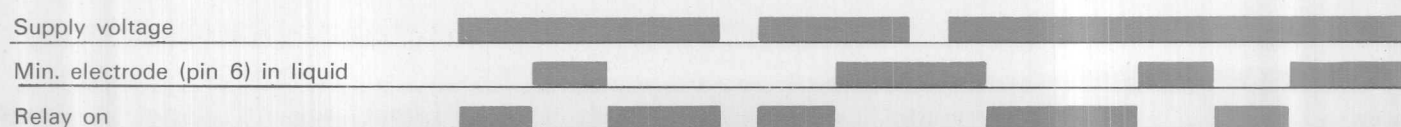
Example 2

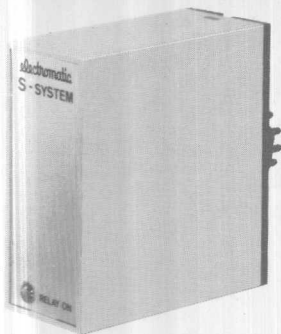
The diagram shows the level control connected as max. or min. control, i.e. registration of 1 level.
The relay releases when the electrode (pin 6) is in contact with the liquid. Again an additional electrode has to be used if the container consists of a non-conductive material.
(To be connected to pin 7).

OPERATION DIAGRAM Ex. 1.



OPERATION DIAGRAM Ex. 2.





SV 150/250
Factory-set sensitivity

SV 150/250

- * Level control for solid, fluid or granulated substances.
- * MAX. and/or MIN. control.
- * Factory-set sensitivity.
- * Capacitive sensors.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10–12.

Sensitivity

The sensitivity depends on the type of sensor and the material to be detected.

Short-circuit current
Max. 45 mA.

Sensor voltage
Max. 24 VDC.

Sensor current
Max. 20 mA.

Connection cable between sensor and amplifier.

2-core plastic cable, normally unscreened.
Cable length:
Max. 100 metres.

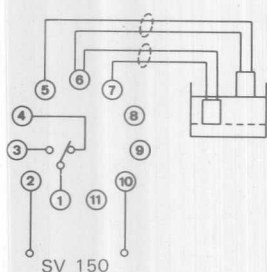
In certain cases it is recommended to use screened cable between sensor and amplifier, e. g. where the cable is placed parallel to load cables.
The screen is connected to pin 6.

Accessories

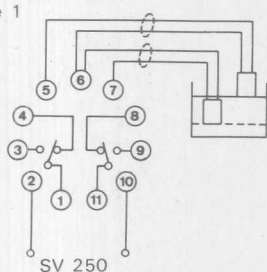
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Level sensors type VR and type VRY.
See catalogue on accessories.

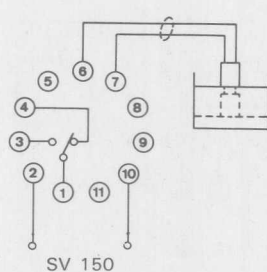
WIRING DIAGRAMS



Example 1

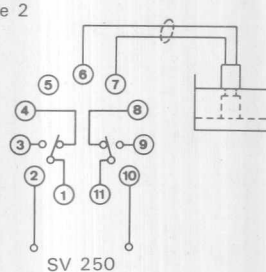


SV 250



SV 150

Example 2



SV 250

MODE OF OPERATION

Max. and/or min. control of solid, fluid or granulated substances, e.g. sand, gravel, sugar or chemicals.

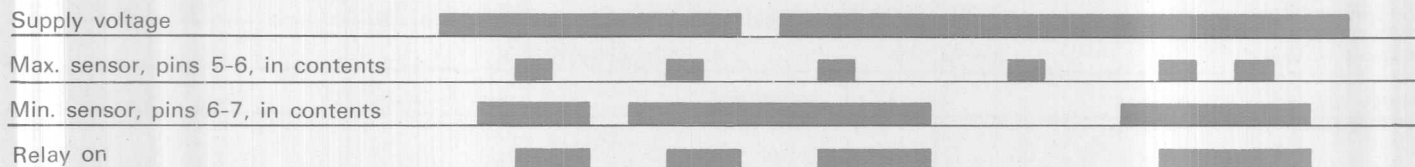
Example 1

The diagram shows the level control connected as max. and min. control, i.e. registration of 2 levels.
The relay operates when the contents reach the max. sensor (pins 5 and 6), provided that the min. sensor (pins 6 and 7) is in contact with the contents.
The relay releases when the min. sensor is no longer in contact with the contents.

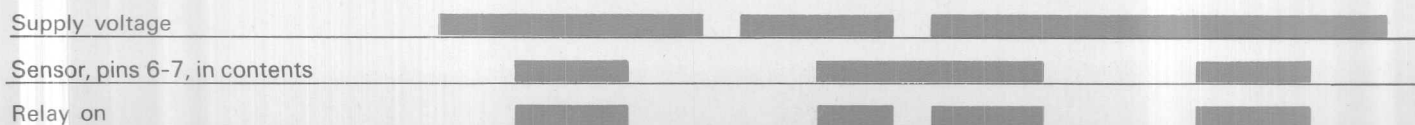
Example 2

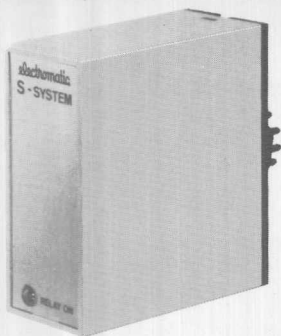
The diagram shows the level control connected as max. or min. control, i.e. registration of 1 level.
The relay operates when the sensor (pins 6 and 7) is in contact with the contents.

OPERATION DIAGRAM Ex. 1.



OPERATION DIAGRAM Ex. 2.





SV 180/280
Factory-set sensitivity

SV 180/280

- * Level control for swimming pools.
- * MAX.-MIN. control for filling.
- * For all conductive and non-conductive liquids.
- * Factory-set sensitivity and delay.
- * 10 A SPDT or 5 A DPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Sensitivity

The sensor is a small heating element and is able to detect all types of liquids.
Typical temperature range:
15°C to 40°C.

Sensor voltage
Max. 12 VDC.

Short-circuit current
Max. 45 mA.

Connection cable between sensor and amplifier.

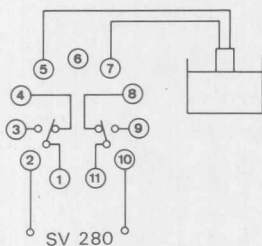
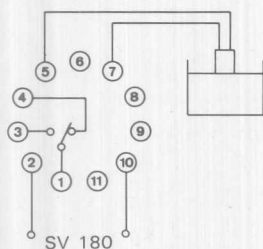
2-core plastic cable, unscreened.
Cable length:
Max. 100 metres.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

Sensor for swimming pools type VJ 1.
See catalogue on accessories.

WIRING DIAGRAMS



MODE OF OPERATION

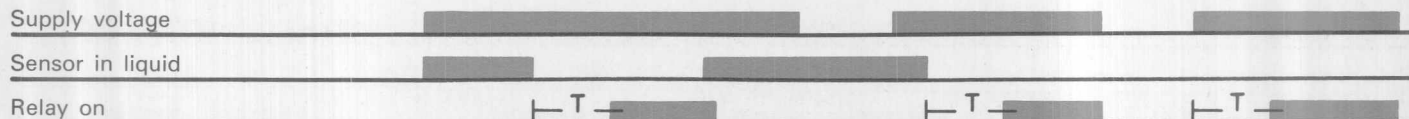
Controlling constant level in liquids with temperatures typ. between 15 and 40°C, e.g. swimming pools.

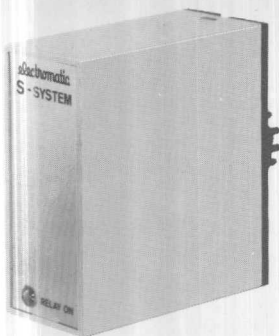
Alarm at too high or at too low liquid level in open or closed containers, in conductive or non-conductive liquids.

When the sensor is in contact with the liquid, the relay is released. If the liquid level falls, the relay operates after a delay of about 1 min. Because of the built-in time delay, disturbances (waves) will not interfere with the function.

S
V

OPERATION DIAGRAM





SV 190
Factory-set sensitivity

SV 190

- * Level control relay for liquids or granulates.
- * Used with refractive optical sensors in virtually all liquids, or with capacitive sensors in liquids or granulates.
- * Controls liquid/granulate presence or absence with one sensor, or liquid/granulate level within max. /min. limits with two sensors.
- * Choice between normal or inverted function.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC- or DC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Sensor inputs

Pins 5-7 and 6-7.
Logical "1": 0- 3 VDC.
Logical "0": 8-12 VDC.
Input resistance: 25 K Ω .

Time lag

Maximum time lag between connection of supply voltage and functioning: 500 ms.

Activating frequency

Maximum 5 Hz.

Supply voltage to sensors

Pins 7-9: 12 VDC.
Stabilized.
Pin 9 positive.
Max. 60 mA continuous.
Short-circuit safe.

Connection cable between sensors and S-system

3-core PVC cable.
Can be extended if necessary, maximum resistance however: 100 Ω .

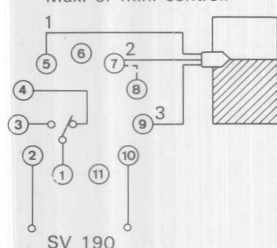
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

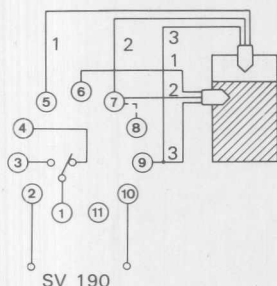
Infrared, refractive level sensors type VP 2 E (with unmodulated light), and type VP 2 EM (with modulated light).
Capacitive sensors type DR 3 E/DR 3 GE, DR 6 E/DR 6 GE and DR 10 E/DR 10 GE.
Optical sensor type DP 10 E/DP 10 GE.
See catalogue on accessories.

WIRING DIAGRAMS

Example 1
1 sensor = 1 level
Max. or min. control.



Example 2
2 sensors = 2 levels.
Max. and min. control.



1 = Yellow core.
2 = Black core.
3 = Red core.

SV 191:

For sensors with PNP output transistor (open collector) S-system type SV 191 can be used.

MODE OF OPERATION

Example 1

One sensor/one level

The relay operates when the sensor is immersed, and releases when the sensor is no longer immersed.
When pins 7 and 8 are interconnected (dotted line), the opposite switching mode is obtained. (Inversion).

Example 2

Two sensors/two levels

The relay operates when the upper sensor (maximum level) is immersed, and releases when the lower sensor (minimum level) is no longer immersed.

When pins 7 and 8 are interconnected (dotted line), the opposite switching mode is obtained. (Inversion).

Inverted switching mode

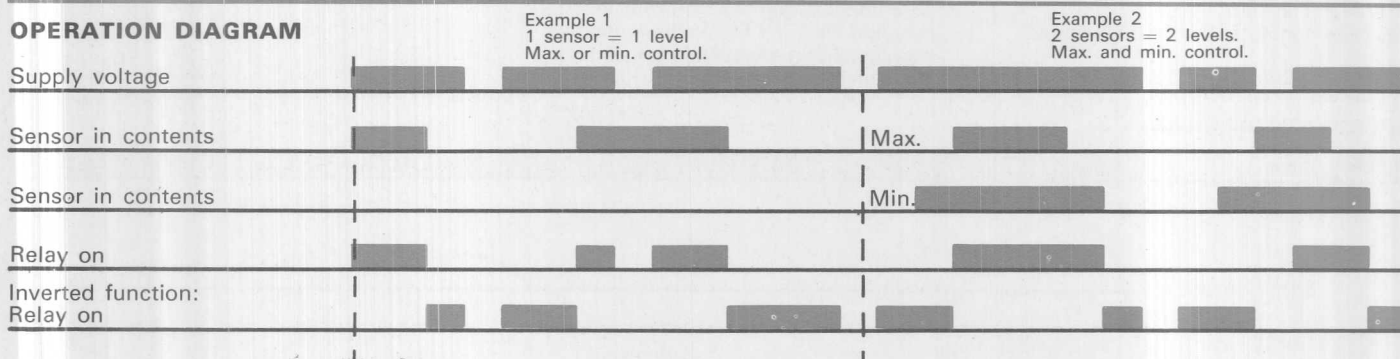
In fill-up applications inverted switching mode (pins 7-8 connected) should always be used, and the pump always be powered through pin 3 (relay ON).
The relay now releases at desired levels, causing the pump to stop. In case of S-SYSTEM supply voltage interruptions, the relay shall of course also release and the pump stop, whereby overflow is safely prevented.

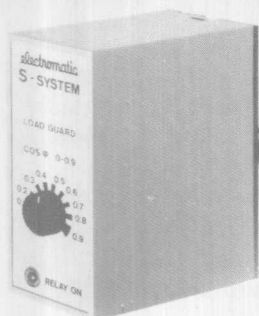
Sensor characteristics

The capacitive sensors DR 3 E, DR 6 E and DR 10 E for solid, fluid or granulated substances. The sensing distance depends on the physical and electrical characteristics of the object to be detected. As a rule you may note that solid or fluid conductors are detected at a greater distance than light or porous insulators.

Optical sensor DP 10 E with adjustable sensing distance up to 150 mm is also applicable in conjunction with the SV 190.

OPERATION DIAGRAM





SY 115
Knob-adjustable

SY 115

- * Load guard for asynchronous motors and other symmetrical loads.
- * Measures phase difference ($\cos \varphi$) between motor current and -voltage.
- * Measuring range: $\cos \varphi = 0 - 0.9$ with current metering transformer type MI 100/MI 500.
- * Knob-adjustable.
- * With delayed function on start.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Supply voltage

3x380 VAC (type SY 115 380).
3x220 VAC (type SY 115 220).
Available for 3 x 415 VAC upon request.

Measuring range

$\cos \varphi = 0-0.9$.
With current metering transformer type MI 100 or MI 500.

Adjustment

Knob-adjustable with absolute scale ($\cos \varphi$).

Hysteresis

10° equalling app. 1 graduation mark.

Start

On connection of supply voltage, the relay is energized for app. 5 seconds (T).

Measuring of current phase

Measuring input for connection of current metering transformer: Pins 8-11.

Voltage from current metering transformer:
0.1 - 4 V_{peak}.

If the current is below 2.5 A, the

conductor may be drawn through the central hole of the current metering transformer many times, so that the number of turns multiplied by the current consumption is inside the current range of the transformer.

The current metering transformer should be mounted in such a way that the current »flows« from the front towards the rear of the transformer.

Measuring

The voltage as well as the current are measured on the phase connected to pin 5.

Inversion

The output signal can be inverted by interconnecting pins 9 and 11.

Reaction time

During operation:
Typically 0.5 seconds.

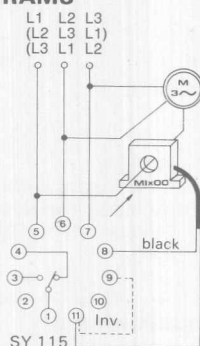
Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

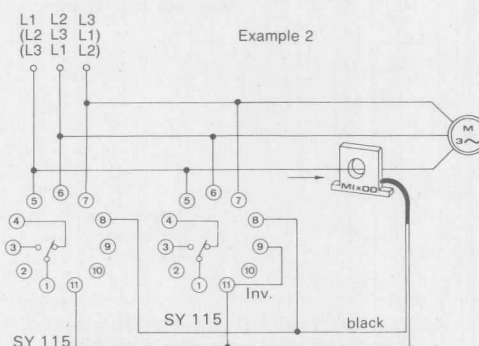
Current metering transformer type MI 100 and MI 500.
See catalogue on accessories.

WIRING DIAGRAMS

Example 1



Example 2



MODE OF OPERATION

This S-system can be used for monitoring the actual load of asynchronous motors. The SY 115 measures the angle between motor current and motor voltage, i.e. phase angle difference. This angle always exists and its change is almost proportional to the actual motor load (contrary to the motor current solely).

The characteristics of the load depend on the type of motor, and the phase difference, $\cos \varphi$, depends upon the actual load. It is therefore recommended to adjust $\cos \varphi$ after practical tests.

The relay contact in the SY 115 should

be employed as a stop function in a system with external restart.

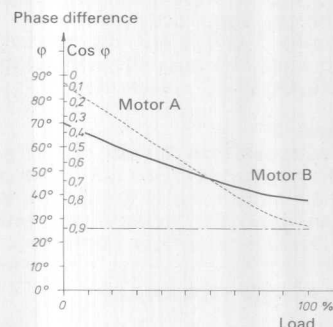
Example 1

The SY 115 is connected to a current metering transformer type MI as well as to a 3-phased asynchronous motor. The relay operates when $\cos \varphi$ is below the set value. At inversion (stippled line) the relay operates when $\cos \varphi$ exceeds the set value.

Example 2

By a combination of normal and inverted function, the SY 115 monitors whether $\cos \varphi$ is within a set maximum and minimum level respectively.

Phase difference/Load



OPERATION DIAGRAM

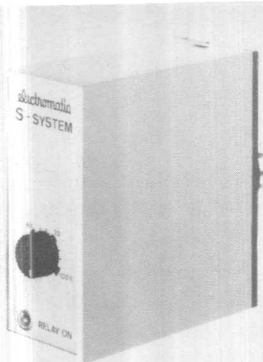
Supply voltage

Set value, $\cos \varphi$

Hysteresis

T

Relay on



SY 125
Knob-adjustable

SY 125

- * AC power metering and power direction relay, 1-phased and symmetrical 3-phased.
- * Measures average power of $U \times I \times \cos \varphi$ up to 125 kW.
- * 3 voltage metering ranges and 2 current metering ranges.
- * Analogue voltage output for up to 5 current metering relays type SM 115.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC supply voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Adjustment
Knob-adjustable level of average power on scale from 10 to 100 %.

Measuring ranges

Type	Voltage range (VAC)	Transformer type	Current range (A)	Power range (kW)
SY 125 220	190-250	MI 100	10-100	2.5 - 25
		MI 500	50-500	12.5 - 125
SY 125 120	105-135	MI 100	10-100	1.35 - 13.5
		MI 500	50-500	6.75 - 67.5
SY 125 024	21-27	MI 100	10-100	0.27 - 2.7
		MI 500	50-500	1.35 - 13.5

Input voltage
Pins 5-7: 0.1 - 4 V.
Maximum 20 V.

Hysteresis
App. 10 % in the upper range,
and app. 30 % in the lower range.

Voltage output
Pins 6 and 7: 0.4-4 VDC (equalling 10 to 100 % of average power), provided that the direction of power is correct. Pin 6 positive.
Note:
Pin 7 is connected internally to pin 10.
Up to 5 current metering relays type SM 115 can be connected as shown below, example 1.

Direction of power
If the direction of the power is opposite to that required, the output relay remains in its resting position (pins 1-4), the voltage output is neutral, and the instrument displays zero.

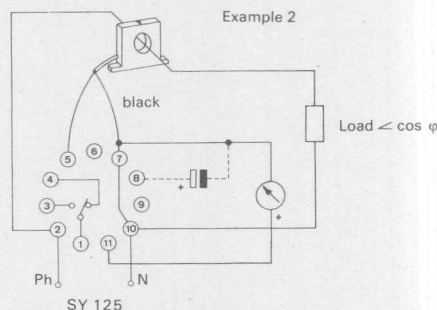
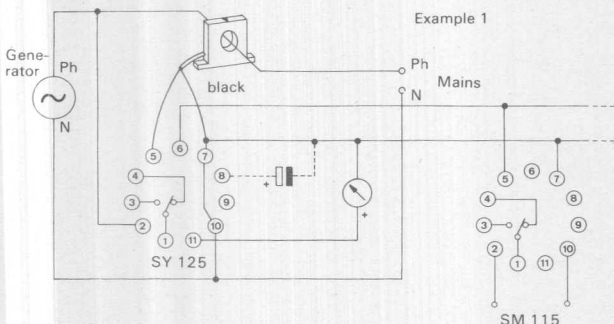
Instrument output
Pins 7 and 11. Pin 11 positive.
Output impedance: 3.9 k Ω .
Connection for moving-coil instrument with 1 mA full scale deflection, internal resistance 110 Ω . 100 % average power causes full scale deflection.

Damping of instrument and relay
A capacitor can be connected between pins 7 and 8. Pin 8 positive.
Capacitor data: 20 VDC; 10 - 1,000 μ F.
Great capacitance means great power damping.

Accessories
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.
Current metering transformer type MI 100 or MI 500.

See catalogue on accessories.

WIRING DIAGRAMS



Note:
Pin 7 is connected internally to pin 10 (neutral), and pin 9 must not be connected externally.

MODE OF OPERATION

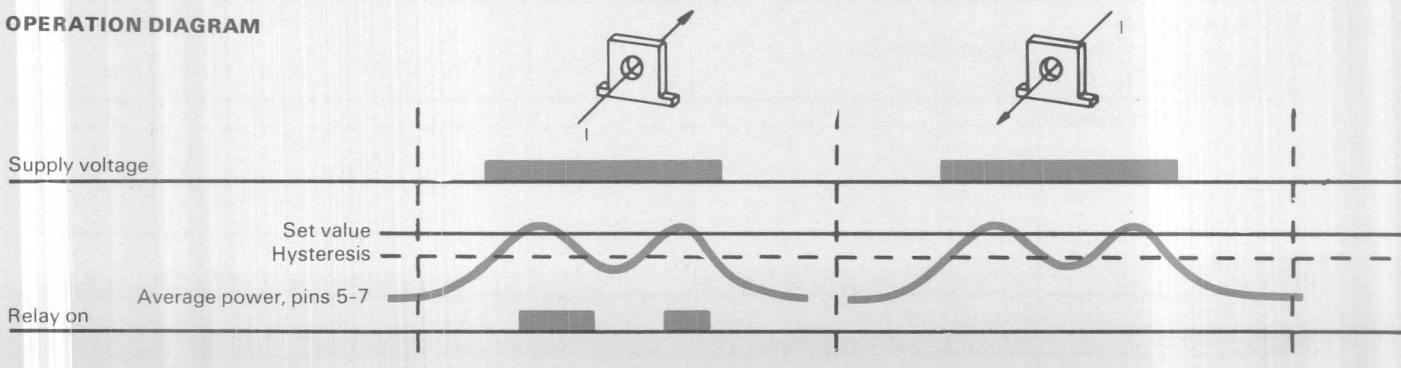
AC power metering and power direction relay. The relay measures average power, $U \times I \times \cos \varphi$, up to maximum 125 kW, and works at the same time as a power direction relay, whereby the relay is suitable for power metering in conjunction with wind-driven generators (windmills).
The relay is used in conjunction with current metering transformer type MI 100 or MI 500.
The SY 125 measures on its own supply voltage.
If greater sensitivity is required, the metering core can be put through the current metering transformer more times.

Example 1
Here the S-system is used in conjunction with a generator connected to the mains. The SY 125 meters the average power supplied from the generator. The value of the average power is read out on the connected instrument.
The relay is applicable for coupling in, f.inst. a heating element, in order to avoid transmission of power to the mains. Stepwise coupling in/out of heating elements is possible by means of up to 5 S-systems, type SM 115 connected to the SY 125.
In this connection the SM 115's work as

power metering relays, as the current supplied from the SY 125 is proportionate to the average power.

Example 2
The SY 125 here meters the power on one phase; at symmetrical load this one is representative of all three phases.
When the registered average power exceeds the set power level, the relay will operate. The relay releases, when the measured average power drops below the set value minus the hysteresis.
The measured average power can be read out on the connected instrument.

OPERATION DIAGRAM





SY 145
Knob-adjustable

SY 145

- * Relay for phase asymmetry.
- * Sensitivity: 5 - 15 %.
- * Knob-adjustable.
- * Operates irrespective of the phase sequence.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC metering voltage: 3 phases and neutral.
- * Supply voltage is the metering voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Inputs

Pins 5 - 6 - 7 and 11.

Measuring-/supply voltage

3 x 220 VAC + N } $\pm 10\%$
3 x 380 VAC + N }

Available for 3 x 415 VAC + N upon request.

Note that the relay is supplied from 3 phases and neutral. Any phase sequence.

Frequency

45-65 Hz.

Phase asymmetry sensitivity

5 - 15 % $\pm 10\%$.
Knob-adjustable.

Hysteresis

15 % of set value.

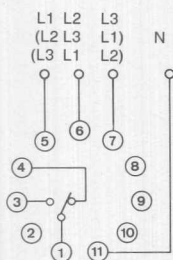
Reaction time

Typ. 1 s.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAM



SY 145

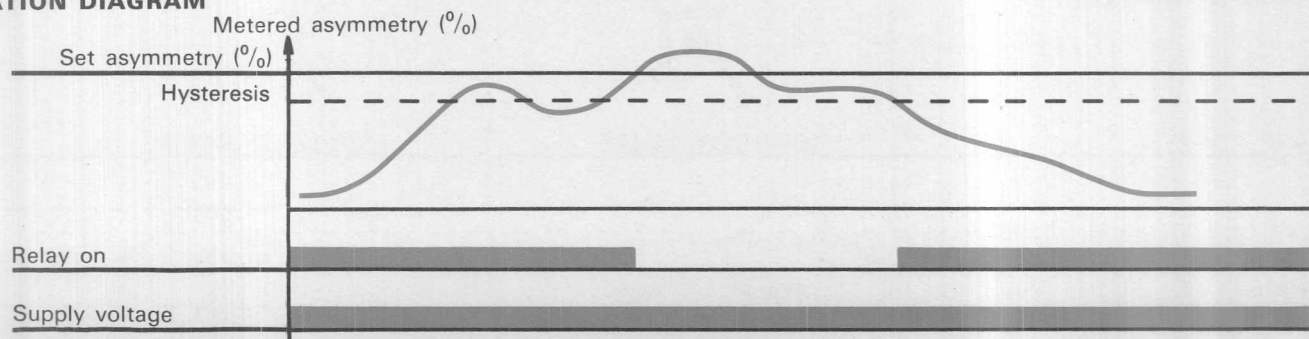
MODE OF OPERATION

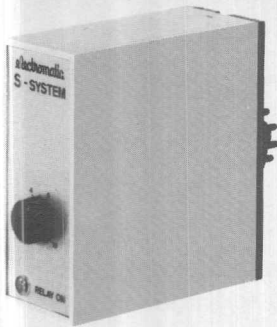
The relay meters and adds deviations from rated values of form factor, phase voltage and phase angles.

It operates irrespective of the phase sequence if the added asymmetry is smaller than the set value.

The relay will release within app. 1 s when the actual asymmetry exceeds the set value.

OPERATION DIAGRAM





SY 155
Knob-adjustable

SY 155

- * 3-phased metering relay for phase-neutral voltages.
- * Controls if all the 3 phase-neutral voltages are within a set joint limit.
- * Knob-adjustable trip point between 85 and 115 % of rated phase-neutral voltage.
- * Operates irrespective of the phase sequence and meters on its own supply voltage.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC-supply voltage. 3 phases + N.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Inputs

Pins 5, 6, 7: Phase L1, L2, L3.
Any sequence.
Pin 11: Neutral.

Supply-/metering voltage

Between lines (Ph-Ph):
3 x 220 VAC + N } $\pm 15\%$
3 x 380 VAC + N }

Available for 3 x 415 VAC + N upon request.

Frequency

45-65 Hz.

Trip point/Scale

Knob-adjustable between 85 and 115 % of rated phase-neutral voltage.
Scale range: - 15 to + 15 %.

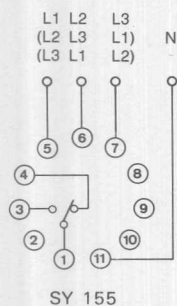
Hysteresis

Fixed hysteresis of either 5, 10, 15 or 20 %. Factory set.
State wanted hysteresis when ordering.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAM



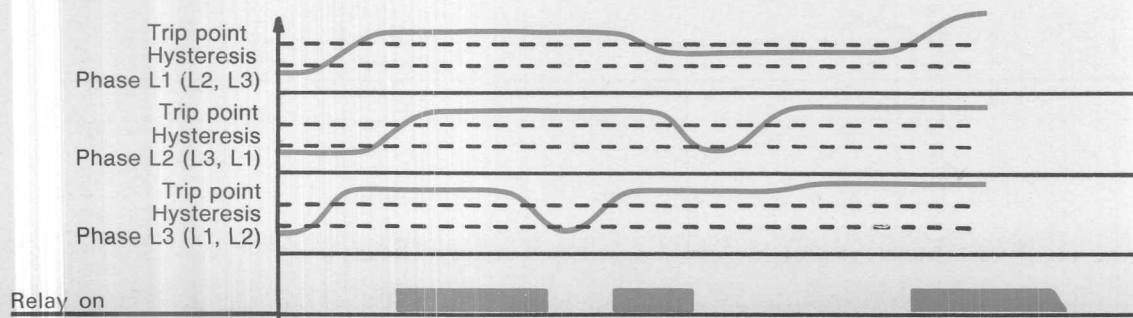
MODE OF OPERATION

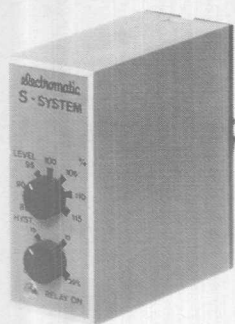
The relay meters the phase-neutral voltage on all 3 phases. The relay operates when all 3 phase-neutral voltages are above the set value.

The relay releases within app. 3 s when at least one phase-neutral voltage drops below the factory-set hysteresis (5, 10, 15 or 20 %), and will not operate again till all 3 phase-neutral voltages exceed the set trip point.

State wanted hysteresis when ordering.

OPERATION DIAGRAM





SY 165
Knob-adjustable

SY 165

- * 3-phased metering relay for phase-phase voltages.
- * Controls if all the 3 phase-phase voltages are within a set joint limit.
- * Knob-adjustable trip point.
- * Knob-adjustable hysteresis.
- * Operates irrespective of the phase sequence and meters on its own supply voltage.
- * 10 SPDT output relay.
- * LED-indication for relay on.
- * AC supply voltage.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Supply-/metering voltage

Between lines (Ph-Ph):
3 x 220 VAC } $\pm 15\%$
3 x 380 VAC }

Available for 3 x 415 VAC upon request.

Frequency
45-65 Hz.

Inputs

Pins 5, 6, 7:
Phase L1, L2, L3.
Any sequence.

Trip point

Knob-adjustable between 85 and 115% of rated phase-phase voltage.
Scale range: -15 to +15%.

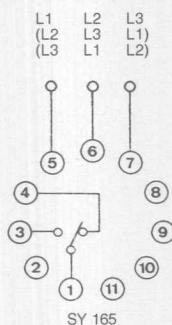
Hysteresis

Knob-adjustable hysteresis: 5 to 20%

Accessories

Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

WIRING DIAGRAM

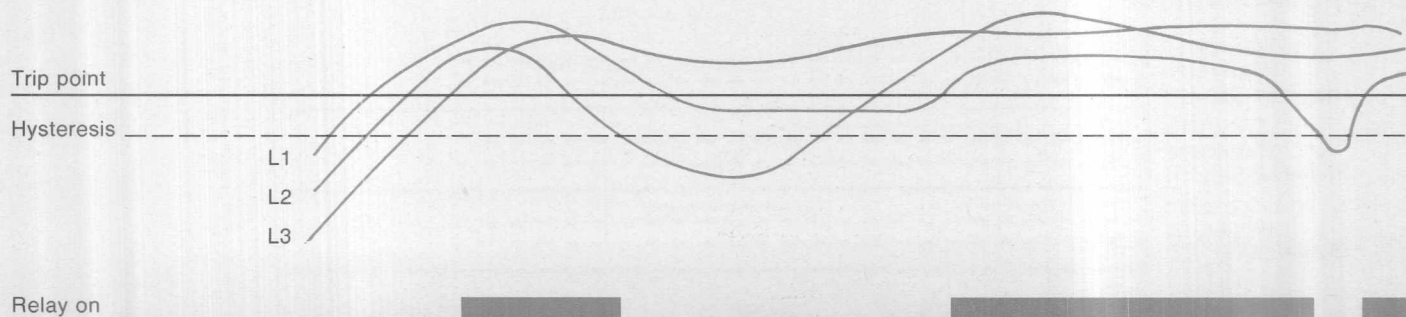


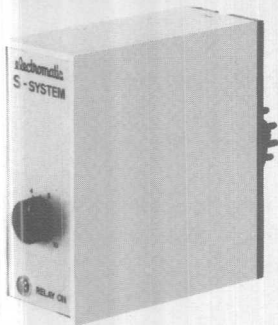
MODE OF OPERATION

The relay meters the phase-phase voltage on all 3 phases. The relay operates when all 3 phase-phase voltages are above the set value.

If one or more phase-phase voltages drop below the adjustable hysteresis, the relay releases within 3 seconds, and it does not operate again until all 3 phase-phase voltages exceed the set trip point.

OPERATION DIAGRAM





SY 185
Knob-adjustable

SY 185

- * Relay for phase angle errors and phase breaking.
- * Metering range for phase angle error: 5 - 15°.
- * Knob-adjustable phase angle sensitivity.
- * Operates irrespective of the phase sequence.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * Supply voltage is the 3-phased metering voltage.

SPECIFICATIONS

Common technical data and ordering key

Pages 10-12.

Inputs

Pins 5-6 and 7.

Metering-/supply voltage

3 x 220 VAC } $\pm 10\%$
3 x 380 VAC }

Available for 3 x 415 VAC upon request.

Any phase sequence. works as supply voltage.

Frequency

50 Hz or 60 Hz.

Phase angle sensitivity

5 - 15° $\pm 10\%$.
Knob-adjustable.

Amplitude sensitivity

$\pm 30\%$.

Hysteresis

Approx. 2°.

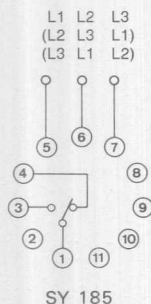
Reaction time

Typically 1 s.

Accessories

Bases.
Hold down spring.
Mounting rack.
Base cover.
Front mounting bezel.

WIRING DIAGRAM



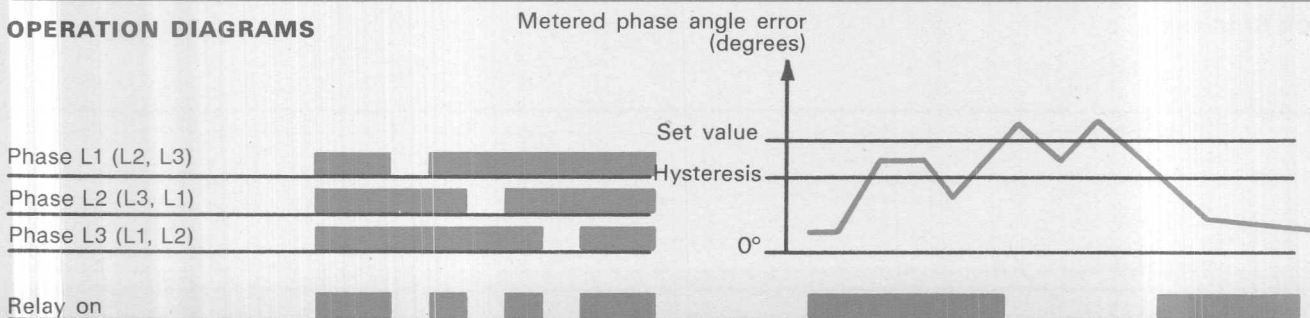
MODE OF OPERATION

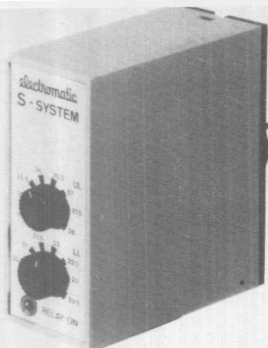
The relay meters on its own 3-phase supply voltage and controls the mutual phase angle.
It operates, irrespective of the phase sequence, when the angle error is smaller than the set value.

In case of interruption of a phase the relay will release, provided that the mutual phase angle error between the flawless phases and the phase possibly regenerated by electric motors connected, exceeds the set value.

Even if the phase angle error does not exceed the set value the relay shall release in case of phase breaking, provided that the voltage regenerated is below 70 % of the nominal voltage.

OPERATION DIAGRAMS





SY 155
Two adjustable knobs

SY 155

- * 3-phased metering relay for phase-neutral voltages.
- * Monitors if all 3 phase-neutral voltages are within set joint limits.
- * Separate adjustment of upper and lower limits.
- * Operates irrespective of the phase sequence, and meters on its own supply voltage.
- * 10 A SPDT output relay.
- * LED-indication for relay on.
- * AC supply voltage: 3 phases + N.

SPECIFICATIONS

Common technical data and ordering key
Pages 10-12.

Hysteresis
Hysteresis on operate:
2 % of the r.m.s. value.

Adjustment
Upper knob:
Upper limit in volts.

Accessories
Bases.
Hold down spring.
Mounting rack.
Base covers.
Front mounting bezel.

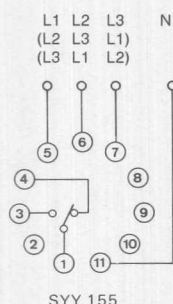
Supply voltage/Measuring ranges

Type	Supply voltage (phase-phase)	Measuring ranges (volt)		
		Range	Lower level	Upper level
SY 155 220	3x220 VAC + N) ± 15%	104-150	104-124	130-150
SY 155 380	3x380 VAC + N) ± 15%	180-260	180-215	225-260

The relay is supplied from 3 phases and neutral.
The phase sequence is arbitrary.
The relay meters average value of a sinusoidal voltage, while the scale ranges are calibrated to r.m.s. value.

Available for 3 × 415 VAC + N upon request.

WIRING DIAGRAM

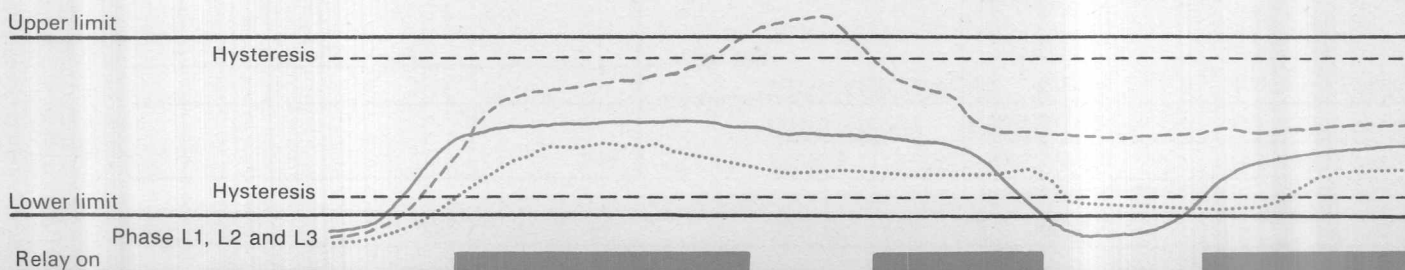


MODE OF OPERATION

Connected to 3 phases and neutral the SY 155 meters sinusoidal voltages. The phase sequence is arbitrary. The relay stays on as long as all 3 phase-neutral voltages are between an upper and a lower limit. The two limits are separately adjusted.

If one or more of the phase-neutral voltages rises above the upper limit or drops below the lower limit, the relay releases. The relay operates again, when all 3 phase-neutral voltages are inside the set limits. The hysteresis on operate is 2 %.

OPERATION DIAGRAM



ACCESSORIES FOR S-SYSTEM

BASES

S 008

8-pole base for printed circuits.

S 011

11-pole base for printed circuits.

Material: Glassfilled NORYL SE 1.

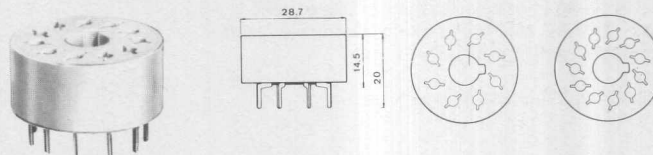
Colour: Light grey.

Material of spring: Tin-plated brass.

Dividing circle: S 008: 20.5 mm - S 011: 22.0 mm.

Hole diameter of

printed circuit: Min. 1.5 mm.



S 108

8-pole base for mounting on or below a chassis with soldering- and plug connections. (AMP 187).

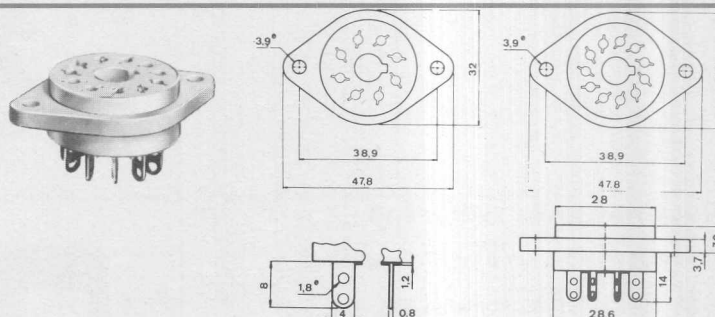
S 111

11-pole base for mounting on or below a chassis with soldering- and plug connections. (AMP 187).

Material: Glassfilled NORYL SE 1.

Colour: Light grey.

Material of spring: Tin-plated brass.



S 108 A

8-pole base for mounting on or below a chassis. For printed circuits.

S 111 A

11-pole base for mounting on or below a chassis. For printed circuits.

Material: Glassfilled NORYL SE 1.

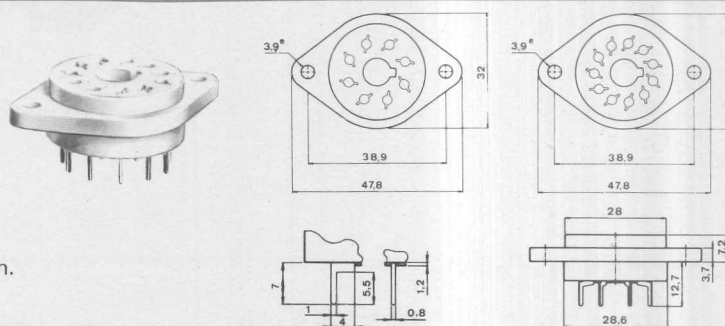
Colour: Light grey.

Material of spring: Tin-plated brass.

Dividing circle: S 108 A: 20.5 mm - S 111 A: 22.0 mm.

Hole diameter of

printed circuit: Min. 1.5 mm.



S 408

8-pole base with front screw connections.

S 411

11-pole base with front screw connections.

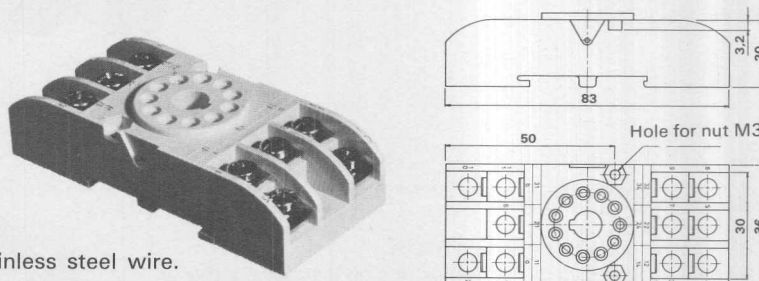
Both types are intended for mounting by 2 screws or for snap-mounting on DIN-rail (DIN 46277), and have captive cable clamps and cross cut terminal screws.

Material: NORYL SE 1.

Colour: Light grey.

Material of spring: Tin-plated brass.

Material of retaining spring for mounting on DIN-rail: Stainless steel wire.



S 908

8-pole base with front screw connections.

S 911

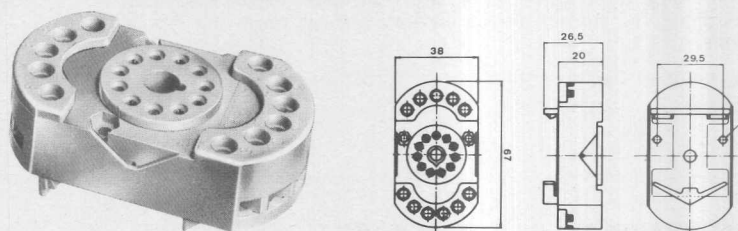
11-pole base with front screw connections.

Both types are intended for mounting by 2 screws or for snap-mounting on DIN-rail. (DIN 46277).

Material: NORYL SE 1.

Colour: Light grey.

Material of spring: Tin-plated brass.



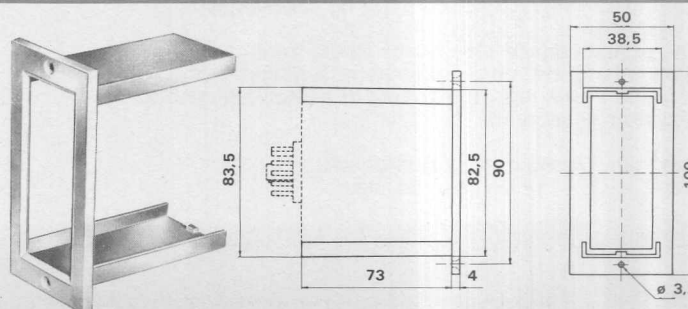
FRONT MOUNTING BEZEL TYPE FRS 2

For front panel mounting of S-systems. The front mounting bezel and the S-system snap together.

Material: Glassfilled NORYL SE 1.

Colour: Light grey.

Panel cutout: 82.5 x 38.5 mm.

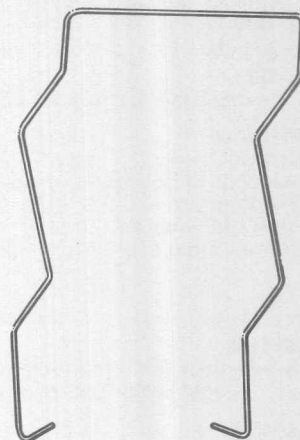
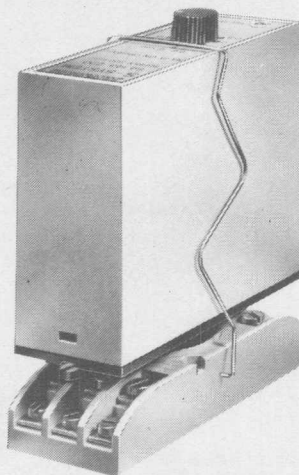


ACCESSORIES FOR S-SYSTEM

HOLD DOWN SPRING TYPE HF

To be used in conjunction with base types S 411 or S 911 for additional fixing of the S-system in places with strong vibrations.

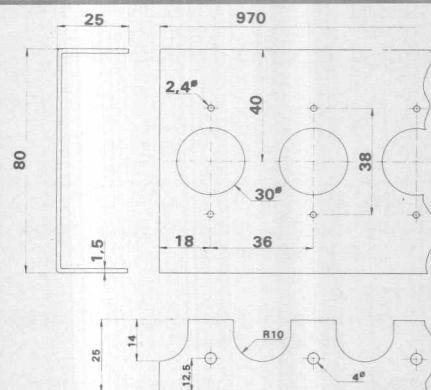
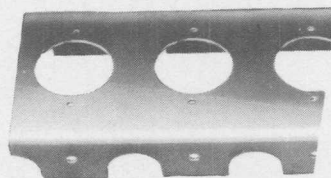
Material: Stainless spring wire.



MOUNTING RACK TYPE SM 13

Mounting rack intended for 27 S-systems.

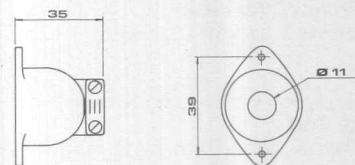
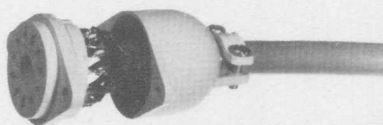
Made of 1.5 mm electroplated iron.
Standard length: 970 mm.



BASE COVER TYPE BB 1

For cover of terminals of bases type S 108, S 111, S 108 A and S 111 A.

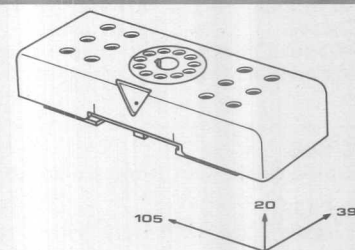
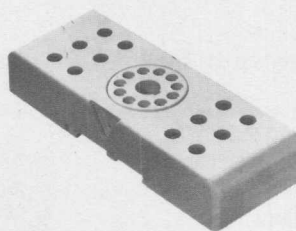
Material: NORYL SE 1.
Colour: Light grey.



BASE COVER TYPE BB 4

Cover for base types S 408 and S 411.
Intended for covering of the front screw connections of the base.
The holes (Ø 5 mm) above the terminals exclude accidental touching, but permit measurements without removing the base cover.

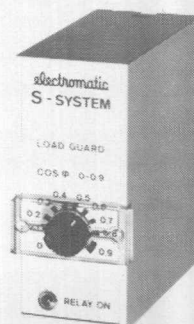
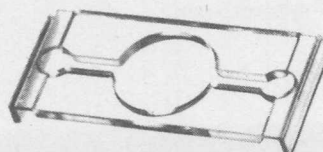
Material: NORYL SE 1.
Colour: Light grey.



POTENTIOMETER LOCK TYPE PL 1

For the locking of potentiometer on knob-adjustable S-systems.
The potentiometer lock snaps to the front of an S-system, and when a potentiometer is placed in the aperture of the lock, the setting of a knob-adjustable S-system is secured.

Material: Transparent polycarbonate.
Size: H × W = 16 × 35 mm.



ACCESSORIES FOR S-SYSTEM

TRANSFORMERS

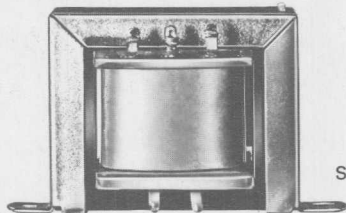
ST 012 Transformer for 5 S-systems.
Prim.: 220/380 VAC.
Sec.: 24 VAC - 0.5 A.

ST 024 Transformer for 10 S-systems.
Prim.: 220/380 VAC.
Sec.: 24 VAC - 1 A.

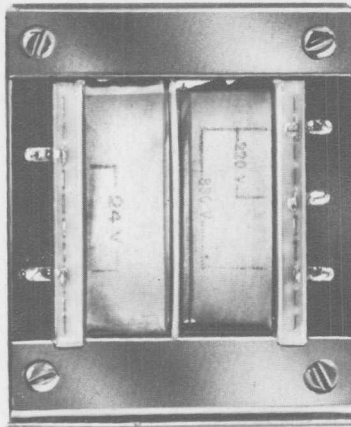
ST 050 Transformer for 20 S-systems.
Prim.: 220/380 VAC.
Sec.: 24 VAC - 2 A.

ST 100 Transformer for 40 S-systems.
Prim.: 220/380 VAC.
Sec.: 24 VAC - 4 A.

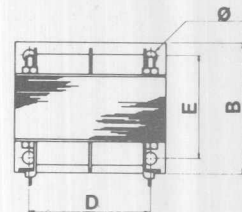
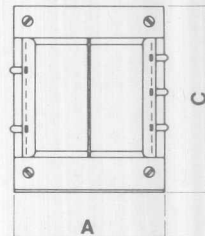
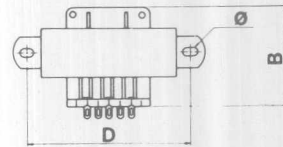
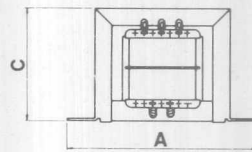
Type	A	B	C	D	E	Ø
ST 012	87	45	53	75		3,5
ST 024	50	60	62	33	48	3,5
ST 050	70	64	87	57	48	5
ST 100	80	75	100	64	64	5



ST 012



ST 024
ST 050
ST 100



INSTRUMENTS

Moving-coil instruments for indication of temperature/revolutions/wind speed/voltage/current by use of amplifiers and relays.
See the individual catalogue pages.

TECHNICAL DATA

Full scale deflection:
Internal resistance:

1 mA
Type ID 120: 110 Ω
Types ID 270-IDM 270: 300 Ω

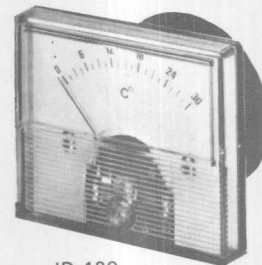
Mechanical dimensions:

Type ID 120

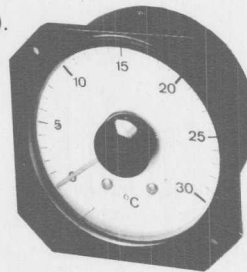
Front frame: 42x48 mm (h x w).
Panel cut out: Ø 38 mm.
Mounting depth: 33 mm.

Types ID 270-IDM 270

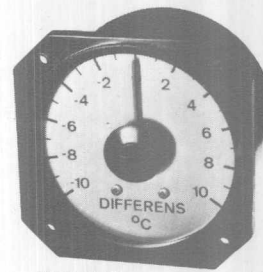
Front frame: 83x83 mm.
Panel cut out: Ø 80 mm.
Mounting depth: 55 mm.



ID 120



ID 270

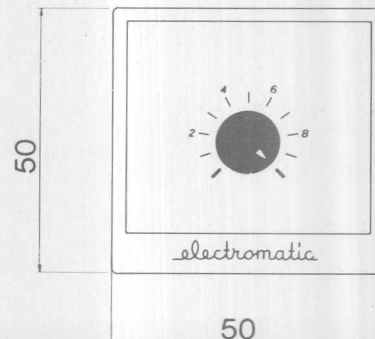
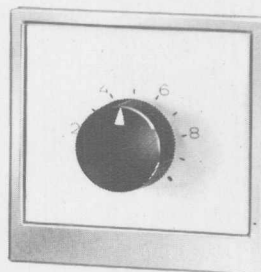


IDM 270

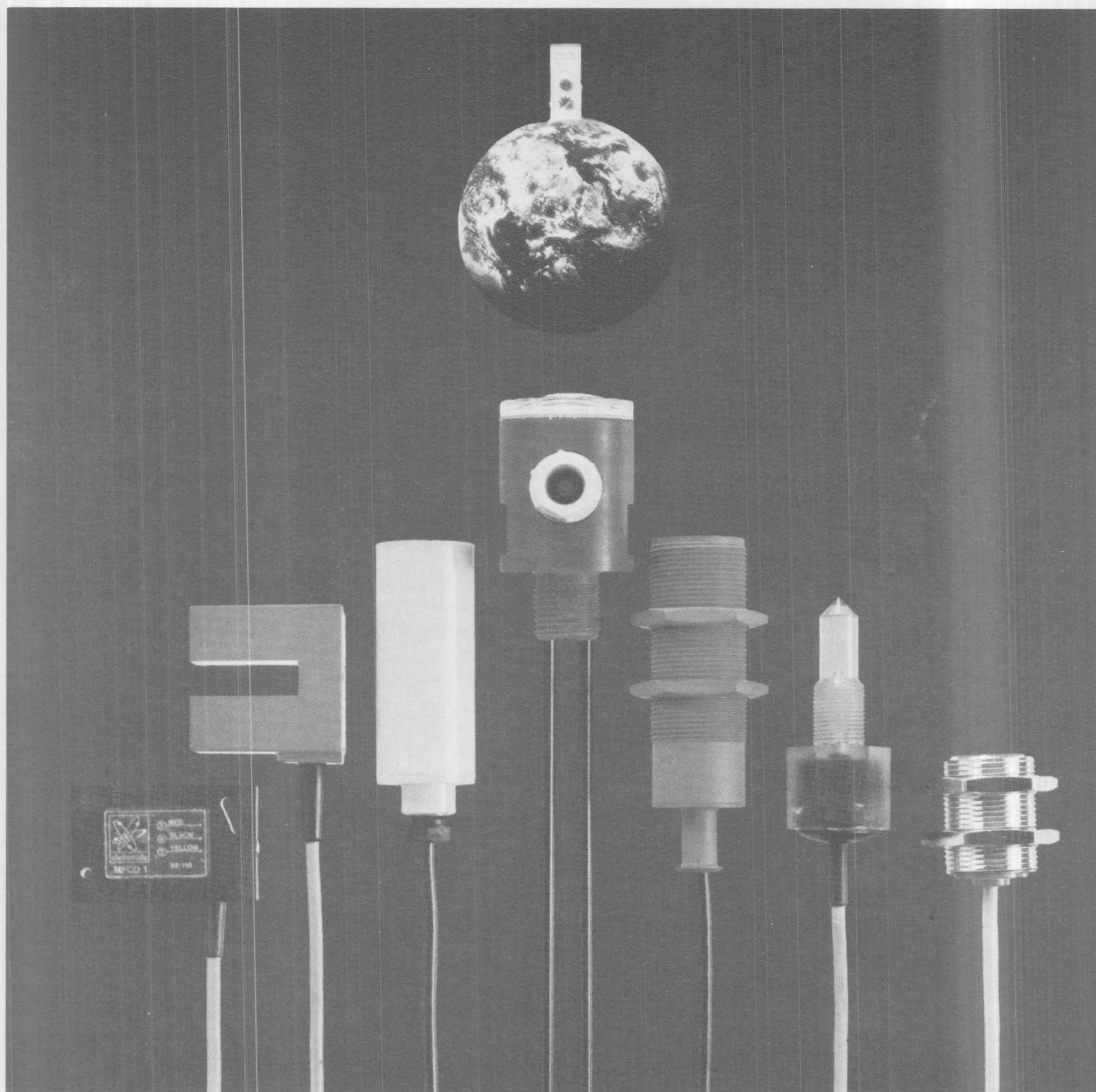
REMOTE POTENTIOMETER KIT TYPE PK

Front plate and linear potentiometer for panel mounting.

By ordering: Specify potentiometer value.



ELECTROMATIC's catalogue on SENSORS



Includes:

Proximity sensors:

- Inductive
- Capacitive
- Optical

Level sensors:

- Level probes
- Capacitive
- Optical

Photosensors:

- Unmodulated IR light
- Modulated IR light

Current transformers

Pressure transducers

Temperature sensors

Gas detectors

Wind metering equipment

Instruments

Base covers etc.

ELECTROMATIC's MANUFACTURING PROGRAMME

COUNTOMATIC

Pulse counters
Pulse-difference and position counters
Pulse counters with pre-selection
Pulse counters with pre-selection and slow-down
Ammeters (AC/DC)
Voltsmeters (AC/DC)
Frequency meters
Digital timer controls
Tachometers
Synchro clocks
Stop watches
Thermometers
Encoders

COUNTOMATIC digital instruments with LED display. The instruments are available for either panel- or table top mounting. AC supply voltage.



Counters/meters according to DIN 43700

Totalizing counters, independent of external supply (inputs for contact/open collector/AC and DC voltage impulse).

Meters/counters, AC/DC supply.

For use in conjunction with exchangeable input modules determining the function of the Countomatic system which is also available with pre-selection and two outputs.

Input modules for the above-mentioned type. Functions: Counter, tachometer, temperature meter, a.o.

COUNTOMATIC counters/meters with readable 4- or 6-digit LCD display. This range is for panel mounting according to DIN 43700 (96 x 48/96 x 96 mm).

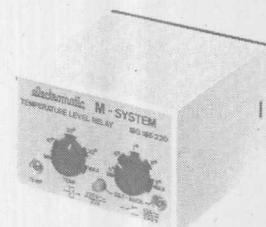


M-SYSTEM

Electronic timing relays and recyclers
Relay for proximity sensors
Relay for photosensors
Relay for temperature sensors
Logic relays
Current-, voltage-, phase-, and frequency relays
Level control relays
Air humidity and twilight relays
Temperature control relays for central heating systems
Remote controlled relays:
By radio transmitter
By infrared transmitters

The M-SYSTEM is electronic automation units intended for DIN-rail mounting in installations and switch boards.

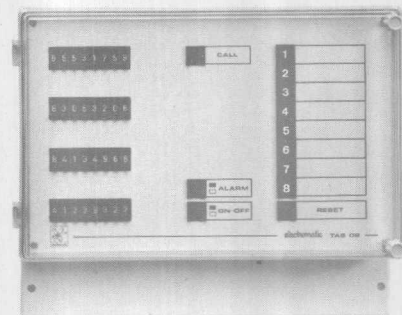
The system is fitted with 11-pin socket. Dimensions: 45 x 70 mm (H x W).



TELEPHONE ALARM/CONTROL SYSTEM

Remote monitoring/control via the public telephone network.
Supply: 12 VAC.
Dimensions: 30 x 25 x 12 cm.

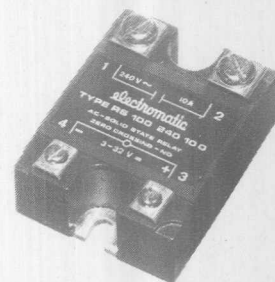
TAS: Telephone Alarm System.
TAS is a complete alarm centre for 2 or 8 inputs. The TAS calls 1 or 4 pre-selected telephone numbers on alarm.
TCS: Telephone Control System.
TCS makes operation of 2 or 10 functions possible by call.



R-SYSTEM

SOLID STATE RELAYS with opto-isolation for switching AC loads up to 40 A and 440 V.

Zero-voltage or instant turn on,
Switching modes NO or NC.
Screw terminals or pins for PCB mounting.



T-SYSTEM

Time units
Units for various sensors
Level control units
Logic units
Current-, voltage units
Dividing-, decade-, and tachometer units
Power outputs for AC/DC

The T-SYSTEM consists of all-electronic mini circuit blocks with two antivalent 200 mA outputs. Supply voltage: 10-40 VDC.

